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Dark green.

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OF

SOUTH AFRICAN BOTANY

VOL. II.

PLANTAE NOVAE AFRICANAE.

"Ex Africa semper aliquid novi."—*Pliny.*

SERIES V.

By

Paymaster-Captain T. M. Salter, R.N. (Ret.).

Oxalis lineolata, Salter (Oxalidaceae), § Tripartitae (Lineares).

Planta parva, caule exserto, 5—8 cm. alta. *Bulbus* elongatus, distortus, valde attenuatus, 3—4·5 cm. longus, tunicis numerosis laxis acutissimis, retrorse brunneo-velutinis, exterioribus saepe diffissis et ligulatis. *Rhizoma* 8—10 cm. longum, gracile, breviter glanduloso-pilosum, squamis paucis, parvis, semiamplexicaulibus, membranaceis instructum. *Caulis* 1—5 cm. longus, pilis brevibus capitatis sparsissime pilosus, atro-viridis, squamis 2—6, ovatis cuspidatis brunneis indutus. *Folia* 10—20, caulis apice conferta, petiolis 0·5—1·5 cm. longis, minute sparseque glanduloso-pilosis: foliola 3, sessilia, linearia vel anguste lineari-cuneata, involuta vel conduplicativa, falcata, emarginata, 4—9mm. longa, glabra, striis elongatis pellucidis (in sicco atris) ornata. *Pedunculi* uniflori, satis numerosi, apicales, 1·5—2 cm. longi, vel e squamis superioribus caulinis exorientes, paulo longiores, glabri, prope apicem bibracteati bracteis minutis subulatis alternantibus callosis, 1·5 mm. longis. *Sepala* late lanceolata vel ovato-lanceolata, glabra, lineis pellucidis (in sicco atris) longitudinaliter striata, ad marginem saepe violaceo-membranacea, ecallosa. *Corolla* 1·0—1·6 cm. longa, tubo infundibuliforme luteo: petala subadscendentia, oblique cuneato-spathulata, apice rotundata, longitudinaliter concava, ad 3·5 mm. lata, superne ad marginem lineis paucis brunneis notata. *Filamenta* (parte connata inclusa) exteriora 2—3·5 mm., glabra, interiora 3—5 mm. longa, margine exteriore sparse glanduloso-pilosa, leviter gibbosa. *Ovarium* oblongum 1·5—1·7 mm. longum, in dimidio superiore pubescens, callis numerosis atris notatum, stylis inferne pubescentibus, superne glanduloso-pilosis. *Capsula* ovato-oblonga, loculis 3-ovulatis.

Hab. Cape Province: Clanwilliam Div.; near Doornbosch in dry shale flats, flowers May-June, *Salter* 5382 (*type* in Bolus Herbarium), 4442, 4548, 5384.

An affinity of *O. Burkei*, Sond., but a much smaller plant, also differing in having narrow concavely channelled petals which taper cuneately to the base, without an obvious claw, and a distorted bulb with loose retrorsely velvety tunics. It is also nearly related to *O. Robinsonii*, Salter and Exell, particularly in the shape of the petals, but the arrangement of the leaves brings in into a different section. (V.V.S., V.V.C.)

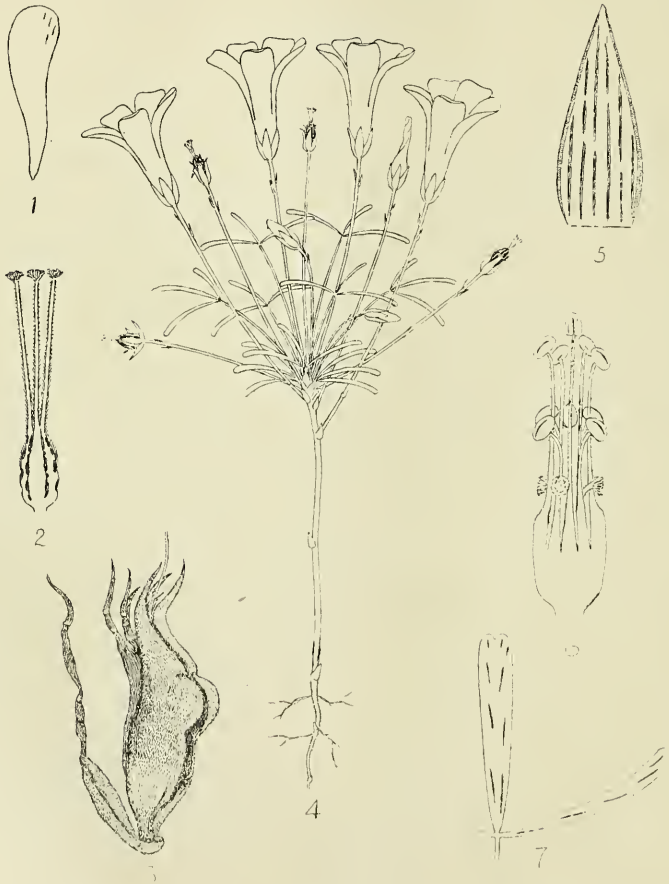

FIG. 1. *Oxalis lincolata* Salter. 1. Petal × 2. 2. Gynaecium × 8. 3. Bulb, natural size. 4. Plant × 1½. 5. Sepal (dried) × 10. 6. Androecium × 8. 7. Leaf (dried) × 5. (*Salter* 5382.) *Del.* T. M. Salter.

Oxalis Massoniana, Salter (Oxalidaceae), § Sessilifoliatae.

Planta parva erecta, caule exserto, 4—6 cm. (in umbrosis ad 24 cm.) alta. *Bulbi* valde congesti, saepe 2 cm. longi, seniores annorum praeteritorum in serie submoniliforme persistentes: tunicae tenues vel vix papyraceae, retrorse pilosae, interiores lanceolatae, acutissimae, nitentes, brunneae, exteriores lineares vel augustissime lamellatae, crebre plicatae, atro-brunneae. *Partes herbaceae* pilis adscendentibus canis pilosae. *Caulis* simplex, 2—4 cm. longus, ruber, ad basin squamis paucis indutus, superne dense foliatus. *Folia* imbricantia, superiora subsessilia, inferiora breviter petiolata petiolis squamiformibus striatis 0·5—1 mm. longis: foliola 3, linearia, obtusa, marginibus involutis, interdum conduplicativa, circa 5 mm. longa, 1 mm. lata, supra glabra, infra pilosa, lineis parvis pellucidis (in sicco atris) striata. *Pedunculi* uniflori, e foliorum axillis exorientes, graciles, ad basin articulati, 2—3 cm. longi, rubro-brunnei, in parte superiore bibracteati bracteis subulatis striatis rubescentibus, 2—3 mm. longis. *Sepala* late lanceolata, 4—5 mm. longa, ciliata, rubescentia, lineis pellucidis (in sicco atris) striata. *Corolla* 1·6—1·8 cm. longa tubo infundibuliforme, cum faucibus, luteo: petala cuneato-obovata, ad basin leviter attenuata, antice rotundata, 7—9 mm. lata, in parte superiore ($\frac{1}{3}$) rubro-miniata, in parte inferiore ($\frac{2}{3}$) lutea, ad marginem exteriorem sparse pubescentia et lineis (in sicco) atris notata. *Filamenta* (parte connata inclusa) exteriora 1·8—3 mm., interiora 3—6 mm. longa, ad apicem sparsissime glandulosa, vix gibbosa. *Ovarium* ovoideo-oblongum, 1·5—2 mm. longum, glabrum vel in parte superiore pubescens, loculis 1-ovulatis, callis numerosis ornatum, stylis sparse pubescentibus, pilisque paucis capitatis admixtis.

Var. *β.* **flavescens.** *Planta* robustior, saepe e basi bi-ramosa. *Pedunculi* numerosi. *Corolla* pallide flavo-straminea, ad marginem exteriorem conspicue atro-lineata et purpureo-maculata. *Ovarium* loculis 2—3-ovulatis.

Hab. Cape Province: Calvinia Div.; summit of Van Rhyn's Pass in damp muddy shallow sandy soil overlying flat rock, flowers May, *Salter* 705 (*type*) 1607 cult., 2144, 5360, *Pillans* 6644; *β*, 7 miles east of Nieuwoudtville, in hard clayey soil, May, *Salter* 4474 (*type*); 7 miles north of Nieuwoudtville, June, *Salter* 4566. Both types are in the Bolus Herbarium.

This species is perhaps the most strikingly handsome of all the South African Oxalis, and I have named it in honour of Francis Masson, who first collected and sent to Banks a flowerless specimen (now in the Brit. Mus.) of the Oxalis which now bears my own name (*O. Salteri*, L. Bolus in Journ. of Bot., lxvii (1930), p. 75).

Its nearest affinity is *O. pardalis*, Sond., from which it may be distinguished by its canous indument which gives the leaves a glaucous appearance, the brick-red-tipped petals and remarkable bulbs. The dark brown linear plicate tunics which enclose them can best be likened

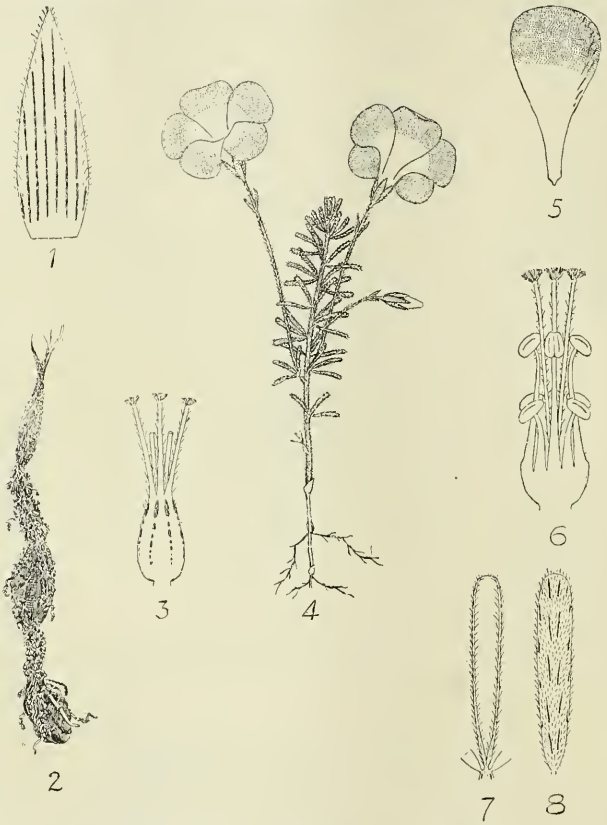

Fig. 2. *Oxalis Massoniana* Salter. 1. Sepal (dried) × 8. 2. Bulb, natural size. 3. Gynaecium × 8. 4. Plant, natural size. 5. Petal × 1½. 6. Androecium × 8. 7. Leaflet upper surface × 5. 8. Leaflet flattened out, under surface (dried) × 5. (*Salter* 5360.) *Del.* T. M. Salter.

to the brown "crinkled" packing sometimes used in boxes of expensive chocolates. The plants often grow in small compact tufts with as many as twenty flowers in bloom at the same time: in shaded positions, or where drawn up by surrounding vegetation, the stem is much elongated.

The extension of the yellow colour of the tube well into the lamina of the petal is a very rare feature in the genus in S. Africa and is only known in one other species, viz. *O. Pageae*, L. Bolus.

The corolla is var. β is pale yellow with a very faint tinge of orange. (v.v.s., v.v.c.)

Oxalis melanograpta, Salter (Oxalidaceae), § Sessilifoliatae.

Planta parva, 2—4 cm. alta, caule foliato exserto. *Bulbus* anguste ovoideus (cum tunicis) saepe 2·5 cm. longus, tunicis numerosis laxe obtectus : tunicae lanceolatae vel ligulatae, apice attenuato-aciculares, nitescentes, brunneae, exteriores pilis brunneis retrorsis inconspicue pilosae. *Rhizoma* 5—8 cm. longum, pilosum, squamis semiamplexicaulibus indutum. *Caulis* ad 2·5 cm. longus, glaber vel ad basin pubescens, in dimidio inferiore squamis 1—4 instructus, superne dense foliatus. *Folia* numerosa, in caulis dimidio superiore conferta, imbricantia, erecto-patentia, petiolis subsquamiformibus 0·5—1 mm. longis : foliola 3, brevissime petiolulata, linearia, conduplicativa vel involuta, saepe falcata, emarginata, 3—7 mm. longa, 0·6—1·2 mm. lata, glabra, infra lineis brevibus numerosis pellucidis (in sicco atris) notata. *Pedunculi* 3—14, uniflori, e foliorum vel rare squamorum axillis exorientes, ad basin articulati, sparse minuteque glanduloso-pilosi, rubro-brunnei, paulo infra calycem bibracteati bracteis suboppositis lanceolatis carinatis rubescentibus, ad 3 mm. longis, sparse glanduloso-ciliatis, sicut foliola lineatis. *Sepala* anguste ovata vel ovato-lanceolata, 2·5—3 mm. longa, in dimidio superiore inconspicue glanduloso-ciliata, lineis pellucidis (in sicco atris) longitudinaliter striata. *Corolla* 1—1·4 cm. longa, rubro-rosea, tubo breve late infundibuliforme luteo : petala cuneato-obovata, ad basin leviter attenuata, antice saepe subtruncata, 5—8 mm. lata, ad marginem exteriorem lineis atris vel brunneis ornata. *Filamenta* (parte connata inclusa) exteriora 2—3·5 mm., glabra, interiora 3·5—7 mm. longa, margine exteriore glandulosa, vix gibbosa, longissima e corollae tubo valde exserta. *Ovarium* ovoideo-oblongum, 1·5 mm. longum, ad apicem sparsissime pilosum, callis numerosis atro-brunneis (in vita pellucidis ?) notatum, stylis inferne glabris, superne minute glandulosis. *Capsula* globosa, loculis 2—3-ovulatis.

Hab. Cape Province : Van Rhyn's Dorp Div. ; 18 miles north-east of Van Rhyn's Dorp, in shale on a low kopje, flowers May-June, *Salter* 714 (*type* in Bolus Herbarium) 2491, 5322, *Pillans* 6664.

A close affinity of *O. pardalis*, Sond., but having a shorter and wider corolla tube from which the longest stamens (or styles) are well exserted and not enclosed within the tube as is *O. pardalis*. The ovary is practically glabrous and the styles are only very minutely glandular-pilose

on the upper half, whereas in *O. pardalis* both these organs are uniformly coated with simple hairs.

Although fairly plentiful in one small area it is apparently very local, for I have searched for it without success on many similar kopjes in the neighbourhood.

Fig. 3. *Oxalis melanograpta* Salter. 1. Gynaecium × 6. 2. Sepal × 12. 3. Petal × 3. 4. Plant × 2. 5. Leaflet (dried) × 4. 6. Androecium × 6. 7. Bulb scales, natural size. (*Salter* 5322.) *Del.* T. M. Salter.

Oxalis heidelbergensis, Salter (Oxalidaceae), § Sessilifoliatae.

Planta erecta robusta, saepe caespitulosa, omnino glabra, caule foliato exserto, 15—25 cm. alta. *Bulbi* subuloidei, saepe congesti, ad 4 cm. longi: tunicae tortuose lanceolatae, longe attenuatae, acutis-

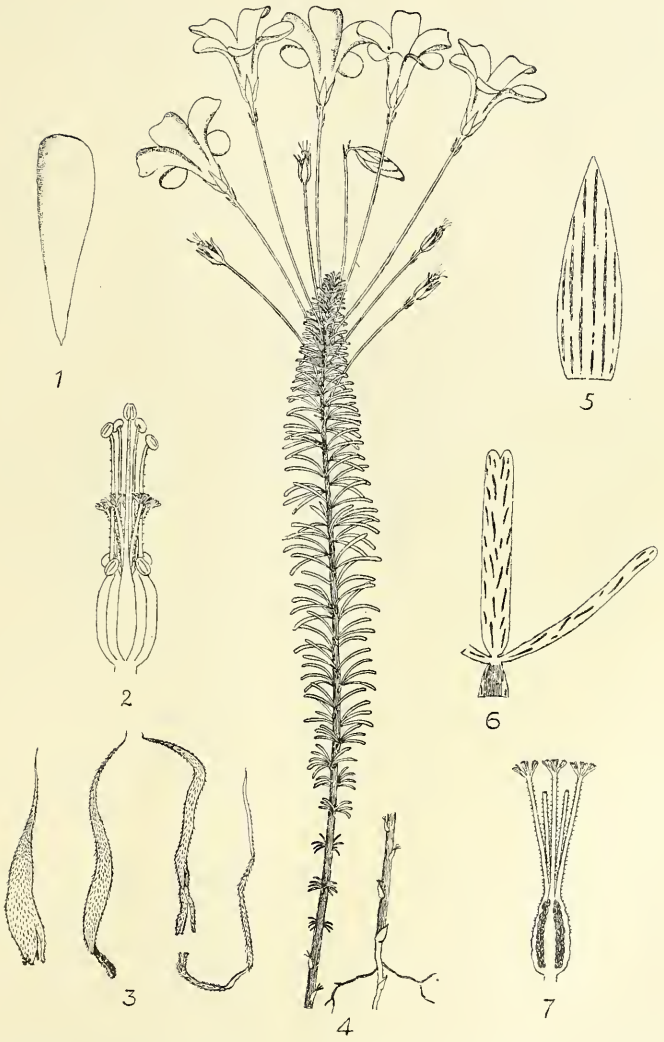

FIG. 4. *Oxalis heidelbergensis* Salter. 1. Petal × 2. 2. Androecium × 6. 3. Bulb scales, natural size. 4. Plant, natural size. 5. Sepal (dried) × 8. 6. Leaf (dried) × 4. 7. Gynaecium × 6. (*Salter* 2385.) *Del.* T. M. Salter.

simae, exteriores diffindentes, itaque lineares vel ligulatae, valde tortuosae, tegimen laxum pseudo-fibrosum formantes. *Rhizoma* 10—15 cm. longum, squamis paucis indutum. *Caulis* subligneus, interdum inferne sparse ramosus, ad basin squamis vel foliis abortivis instructus. *Folia* numerosa, subsessilia, infima subfasciculata, cetera imbricata, reflexa, petiolis squamiformibus, 1—2 mm. longis : foliola 3, sessilia, linearia, involuta vel conduplicativa, falcata, emarginata, 4—8 mm. longa, 0·6—1 mm. lata, striis parvis linearibus atris (in vita pellucidis) conspicue notata. *Pedunculi* uniflori, numerosi, subaequales, graciles, adscendentes, in caulis ramorumque parte superiore ex foliorum axillis exorientes, 3—4 cm. longi, ad basin manifeste articulati, rubro-brunnei : bracteae 2, alternantes vel suboppositae, lineari-lanceolatae, paulo infra calycem positae. *Sepala* late lanceolata, 4—5 mm. longa, lineis brunneis vel atris (in vita pellucidis) longitudinaliter striata. *Corolla* 1·5—1·7 cm. longa, alba, tubo infundibuliforme luteo : petala anguste cuneata, longitudinaliter concava, antice leviter truncata, 4—4·5 mm. lata, ad marginem exteriorem inferiorem rubra. *Filamenta* (parte connata inclusa), exteriora 1·5—3 mm., glabra, interiora 3—6 mm. longa, minute sparseque glandulosa, edentata. *Ovarium* ovoideo-oblongum, ad 2 mm. longum, loculis 4—6 ovulatis, in dimidio superiore glanduloso-pilosum, callis atris (in vita pellucidis) inter angulos obsitum, stylis glandulosis.

Hab. Cape Province : Swellendam Div. ; 8 miles west of Heidelberg, flowers June, *Salter* 2385 (*type* in Bolus Herbarium).

An affinity of *O. confertifolia* O. Kuntze (R. Knuth) and *O. Robinsonii*, Salter and Exell, with both of which I have been able to observe it in cultivation. It differs from the former in having smaller, white flowers, spathulate or narrow cuneate petals without a distinct claw, an ovary almost completely covered with calli and shorter stigmas ; from the latter in having all the leaves subsessile and somewhat reflexed, shorter peduncles and narrower petals. It has produced self-sown flowering seedlings in cultivation.

Oxalis grammophylla, Salter (Oxalidaceae), § Sessilifoliatae.

Planta parva, 3—4 cm. alta, caule breviter exserto. *Bulbi* late subuloidei, congesti, tunicis numerosis laxe obtecti : tunicae acutissimae, pilis subsetiformibus brevibus retrorsis pilosae, exteriores lineares vel lamellatae, ad basin saepe tri-diffissae, nitentes brunneae, interiores lanceolatae atro-brunneae, ad margines pallidae. *Rhizoma* ad 8 cm. longum, squamis parvis indutum. *Caulis* 1—2 cm. longus, simplex vel e basi bifurcatus, dense pubescens, inferne squamis 2—4 semiamplexicaulibus pubescentibus instructus, ad apicem foliatus. *Folia* satis numerosa, ad apicem plus minusve imbricata, inferiora saepe subsessilia,

superiora petiolata : petioli rubescentes, ad 1 cm. longi, sicut pedunculi villosi, ad basin (infra articulum) squamiformes, pubescens : foliola 3, brevissime petiolulata, linearia vel cuneata, conduplicativa vel involuta,

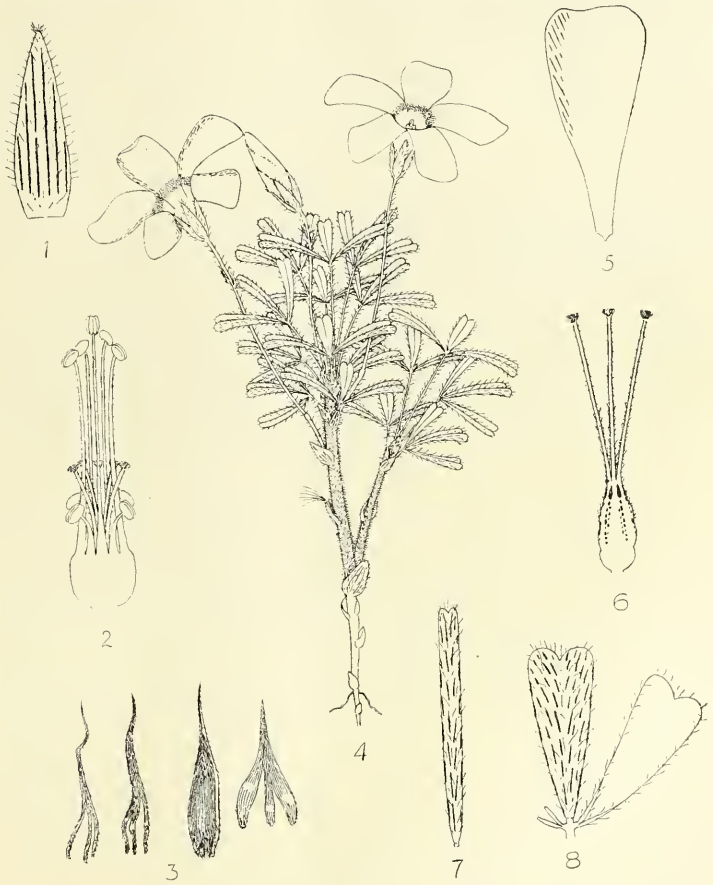

Fig. 5. *Oxalis grammophylla* Salter. 1. Sepal × 8. 2. Androecium × 8. 3. Bulb scales, natural size. 4. Plant × 2. 5. Petal × 3. 6. Gynaecium × 8. 7. Leaflet of form β (dried) × 2. 8. Leaf (dried) × 4. (*Salter* 4469.) *Del.* T. M. Salter.

emarginata, 0·6—1·0 cm. longa, 1·5—3 mm. lata, supra glabra, infra et marginibus villosa, lineis parvis numerosis pellucidis (in sicco atris) notata. *Pedunculi* uniflori, e foliorum axillis exorientes, folia superantes,

1—2 cm. longi, rubescentes, in parte superiore bibracteati bracteis subulatis, 1·5—2 mm. longis, ciliatis, sicut folia lineatis. *Sepala* lanceolata, ad 5 mm. longa, sparse villosa, ciliata, lineis pellucidis (in sicco atro-brunneis) longitudinaliter striata. *Corolla* 1·1—1·5 cm. longa, lutea, tubo infundibuliforme concolore, interdum in faucibus aurantiaco-rubro-annulata : petala cuncata, ad basin leviter attenuata, antice truncata, saepe retusa, 5—8 mm. lata, ad marginem exteriorem aurantiaco-rubro-maculata et striis parvis (in sicco atris) copiose notata. *Filamenta* (parte connata inclusa) exteriora 2—3 mm. glabra, interiora 3—5·5 mm. longa, minute sparseque glandulosa, leviter gibbosa. *Ovarium* ovoideo-oblongum, ad 1·8 mm. longum, in dimidio superiore pubescens cum pilis paucis capitatis admixtis, callis numerosis rubris (in sicco atris) ornata, stylis inferne glandulosis vel pubescentibus, superne glandulosis. *Capsula* late oblonga, loculis 2—3 ovulatis.

Forma β. *Planta* major, ad 10 cm. alta, caulis parte foliata longiore. *Foliola* linearia, ad 2·2 cm. longa. *Corolla* ad 2 cm. longa, sine annulo rubro.

Forma γ. *Foliola* linearia, ad 1 cm. longa. *Corolla* semper annulata. *Stamina* (vel styli) longiora, longissima e corolla tubo breviter exserta.

Forma δ. *Caulis* pars foliata vix elongata. *Folia* subapicalia : foliola parva, late cuneata etiam obovata. *Corolla* 1·5—1·8 cm. longa sine annulo rubro.

Hab. Cape Province : Calvinia Div. ; Karamoe, in hard dry ground, flowers May—July, *Salter* 4469 (*type* in Bolus Herbarium) 1650 A (cult), 5376 : *form β*. Clanwilliam Div. ; 3 miles south-west of Langekraal, 2468, 5387 ; about Doornbosch, 1651 (cult) 5383 : *form γ*, Calvinia Div. ; 2 miles north of Botterkloof, 2478, 4444, 5377 : *form δ*, 7—14 miles east of Nieuwoudtville 4485, 5364, 5365.

This species is evidently widespread in the arid districts of the triangle formed by Calvinia, Nieuwoudtville and Doornbosch and it is remarkable that it has escaped notice for so long. It is exceedingly variable both in the size of the plant and in the shape of the leaves and it is undoubtedly very prone to epharmonic influences. Although more extended collecting and observation may make it possible to separate certain varieties, I have thought it advisable for the present merely to distinguish four *forms* which seem to be more or less definite mutants.

At first sight, in the wild state, it is not obvious that this species should be placed in the section Sessilifoliatae, but in cultivation, plants of the typical form and form *β* produced markedly leafy stems and axillary peduncles, the latter taking an elongate lax procumbent form, unlike *O. lineolata*, Salter (p. 1) in which the stem does not lengthen in cultivation.

It is an affinity of *O. Robinsonii*, Salter and Exell, differing in its rather dense villose indument, much shorter peduncles, differently shaped petals of smaller size, with orange-red markings, although some plants of *form* β (*Salter* 2468) approach that species in stature and leaf form. *Form* δ in one instance (*Salter* 4485) is not unlike *O. Massoniana*, Salter, var. β, *flavescens* (p. 3), but the leaflets are much broader and the leaves petiolate and practically apical on the stem.

The orange-red " eye " is not constant, being always present in form γ, and occasionally in the typical form.

The five preceding species are closely related one to another and belong to a very distinct natural group in the genus, the characteristics of this group being as follows :—

Bulb tunics lanceolate, ligulate or linear, sharply acute at the apex, at least the outer pilose with retrorse hairs. Leaflets linear or linear-cuneate, streaked with short pellucid lines. Sepals striate with pellucid lines. *These lines become black and conspicuous in the dry plant.*

This group also includes five already known species, viz. :—

O. pardalis, Sond.	§ Sessilifoliatae.
O. confertifolia (O. Ktze) R. Knuth.	,,
O. Robinsonii, Salter & Exell	,,
O. Burkei, Sond.	§ Tripartitae (Lineares)
O. capillacea, E. Mey.	§ Multifoliolatae.

and it will be seen that, under the present artificial system of grouping, these five species are divided among three of the existing sections. Pending a complete rearrangement of the South African species in their natural relationship, with a view to simplifying identification of plants in this easily recognisable group, I append a key to the 10 species in question.

A. Leaflets 5 to 9. (Corolla red, white or yellow) .. .. *capillacea.*
AA. Leaflets 3.
  B. Leaves petiolate, arising from the apex of the stem : peduncles apical, rarely axillary in the stem scales.
    C. Petal more than 6 mm. wide, obovate above, tapering to a distinct narrow claw in the lower half : outer bulb scales retrorsely pilose : corolla reddish or white .. .. *Burkei.*
    CC. Petal less than 4 mm. wide, cuneate, without a distinct claw : outer bulb scales retrorsely velvety : corolla white .. .. *lincolata.*

BB. Leaves mostly sessile or subsessile (the upper sometimes petiolate), imbricating on the stem or at least the upper part: peduncles all axillary.
D. Outer bulb scales closely plicate: leaflets somewhat glaucous: (petals rosy tipped) .. *Massoniana.*
DD. Outer bulb scales smooth: leaflets not glaucous.
E. Tube of the corolla shorter than the laminae: longest filaments or styles well exserted from the corolla tube: (corolla rose-red) .. .. *melanographa.*
EE. Tube of the corolla narrower, about equalling the laminae: filaments and styles not exserted, or in *O. grammophylla*, form γ, very shortly exserted.
F. Leaves all subsessile, more or less reflexed.
G. Stout erect plants with a long ligneous leafy stem.
H. Petals more than 7 mm. wide, obovate, tapering in the lower half to a distinct claw: corolla red .. *confertifolia.*
HH. Petals less than 5 mm. wide, cuneate or spathulate without a distinct claw: corolla white .. .. *heidelbergensis*
GG. Dwarf plant, with leaf-bearing upper part of the stem short: (corolla red) *pardalis.*
FF. Uppor leaves petiolate, ascending.
I. Dwarf plant 3—4 cm. high: stem thickly pubescent or villose: peduncles and sepals villose, peduncles less than 4 cm. long: petals slightly attenuate at the base, yellow, orange-red-margined .. .. *grammophylla*
II. Well-developed plant 6—15 cm. high: stem glabrous: peduncles and sepals very sparsely pubescent, peduncles more than 4 cm. long: petals cuneate, not attenuate at the base, white or yellow, narrowly red-margined .. .. *Robinsonii.*

Oxalis crocea, Salter (Oxalidaceae), § Sessilifoliatae.

Planta erecta, caule exserto, plerumque ramulosa, interdum prope fruticulosa, 5—10 cm. alta. *Partes herbaceae* omnino pilis brevibus hyalinis pluricellularibus dense pilosae. *Bulbus* magnus, elongatus, tortuose ovoideo-subuloideus vel obclavatus, tunicis rugosis diffindentibus, papyraceis, atrobrunneis. *Rhizoma* ad 20 cm. longum, inferne annorum praeteritorum tunicis obsitum, superne squamis semiamplexicaulibus indutum. *Caulis* ad 9 cm. longus, saepe ramulosus, ramulis 1—8, ad

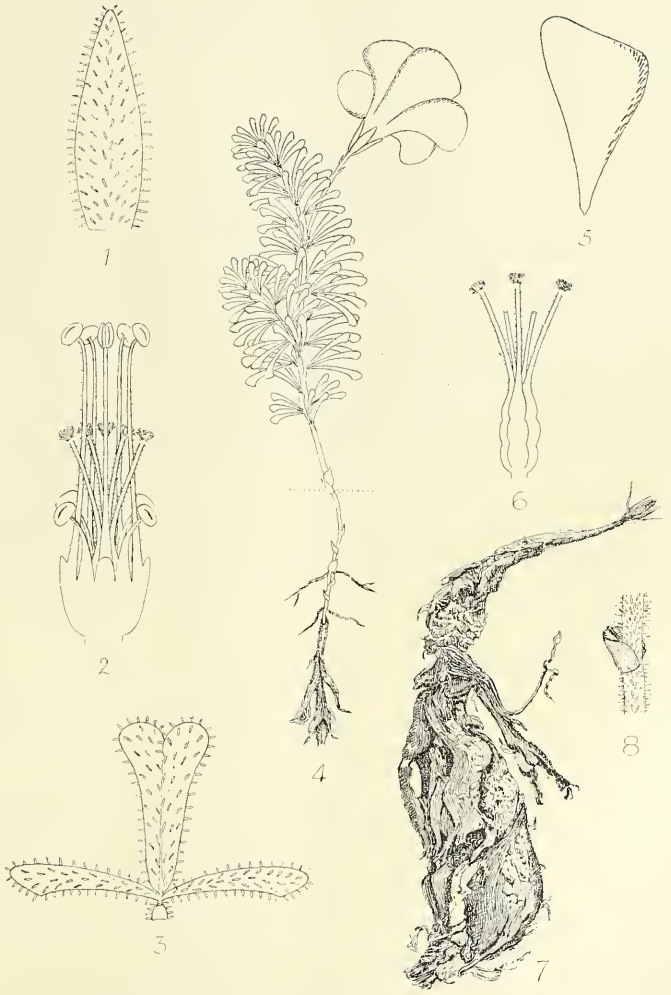

FIG. 6. *Oxalis crocea* Salter. 1. Sepal × 6. 2. Androecium × 6. 3. Leaf under side × 3. 4. Plant, natural size. 5. Petal × 1½. 6. Gynaecium × 6. 7. Bulb, natural size. 8. Portion of stem, with bract × 4. (*Salter* 5550.) *Del.* T. M. Salter.

3 cm. longis, ad basin extremam efoliatus, superne fere secus totum caulem ramulosque dense foliatus. *Folia* numerosa, conferta, alterna, subsessilia, petiolis squamiformibus 0·5—1·5 mm. longis: foliola 3, sessilia, cuneato-clavata, conduplicativa, leviter falcata, antice 1/5-incisa, lobis ovatis, 6—10 mm. longa, 2—4·5 mm. lata, supra glabra, minute impresso-punctata, subglauca, infra et marginibus pilosa. *Pedunculi* 1—5, uniflori, e foliorum axillis exorientes, ad basin articulati, paulo infra calycem bibracteati bracteis subulatis alternantibus, fere 1·5 mm. longis. *Sepala* late lanceolata, 5—6·5 mm. longa, saepe subobtusa, ciliata. *Corolla* 1·8—2·2 cm. longa, laete flava, tubo infundibuliforme concolore: petala late cuneata, ad basin vix attenuata, antice obliquissime truncata, itaque triangularia, 0·9—1·1 mm. lata, ad marginem exteriorem interdum purpureo-maculata. *Filamenta* (parte connata inclusa), exteriora 3—4·5 mm. glabra, interiora 4·5—8 mm. longa, externe sparse glanduloso-pilosa, breviter obtuseque dentata. *Ovarium* oblongum, fere 2·3 mm. longum, glabrum, ecallosum, stylis glanduloso-pilosis. *Capsula* subglobosa, ad 6 mm. longa, loculis 3-ovulatis.

Hab. Namaqualand: 10 miles north-west of Steinkopf, on coarse gravelly slopes facing west, 30 June, 1935, *Salter* 5550 (*type* in Bolus Herbarium).

A very distinct species in the section Sessilifoliatae, distinguished from all others by its clavate leaflets, large elongate blackish bulbs and short, rather stout hyaline hairs in which the cell divisions become apparent in drying.

Oxalis porphyriosiphon, Salter (Oxalidaceae). § Sessilifoliatae.

Planta erecta viscosa, caule exserto, 5—11 cm. alta. *Bulbi* ovoidei vel lato-ovoidei, apice acuti, saepe congesti contortique, 1·5—2 cm. longi, tunicis adnatis viscosis atro-brunneis. *Rhizoma* breve, saepe 1—2 cm. longum, squamis parvis sparse indutum. *Partes* herbaceae pilis capitatis, saepe bicellularibus pilisque brevioribus simplicibus crispatis admixtis pilosae. *Caules* 1—3, e bulbo exorientes saepe 7 cm. longi, inferne squamis parvis late ovatis cuspidatis, superne vel fere omnino foliis alternis dense instructi. *Folia* inferiora subsessilia, superiora breve petiolata petiolis ad 3 mm. longis: foliola 3, sessilia, cuneato-obcordata, plerumque conduplicativo-falcata, 2·5—4 mm. longa, 1—2 mm. lata, supra glabra, infra sparse crispato-pubescentia, nervo medio marginibus pilis longis capitatis pilosa. *Pedunculi* 1—5, uniflori, e foliorum axillis exorientes, saepe 2—3 cm. longi, post anthesin deflexi, ebracteati vel in dimidio superiore bracteis 1 vel rare 2 induti. *Sepala* ovato-lanceolata, ad 3 mm. longa, rubescentia, interdum ad apicem nigrescentia, ecallosa. *Corolla* 2—2·3 cm. longa, praecipue in tubo viscoso-pilosa, rubro-pur-

purea, tubo anguste infundibuliforme saturate purpureo cum laminis aequante, in faucibus luteo-annulata : petala e basi unguiculata angustissime cuneata superne obovata, subtruncata vel leviter retusa, 7—9·5 mm. lata, pilis capitatis ciliata. *Filamenta* (parte connata

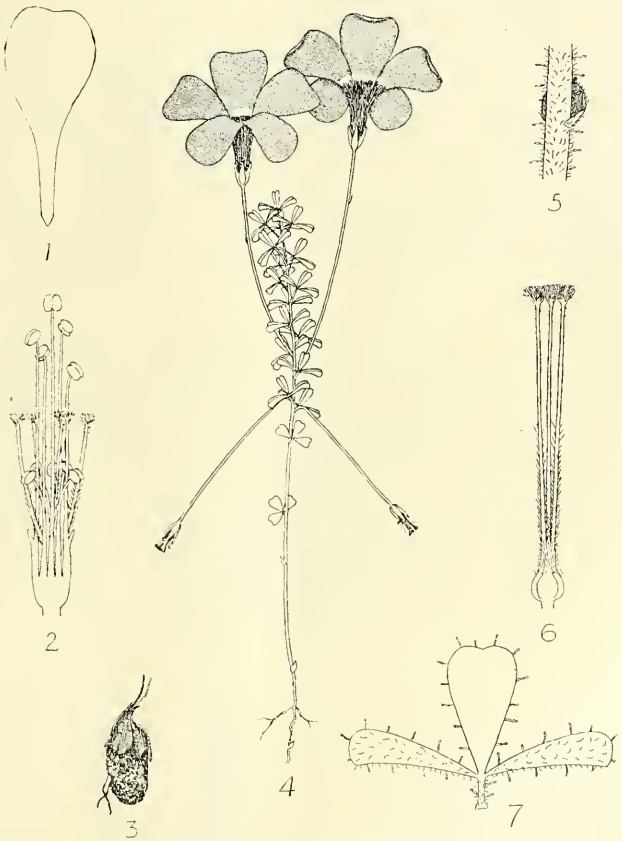

Fig. 7. *Oxalis porphyriosiphon* Salter. 1. Petal × 1½. 2. Androecium × 6 3. Bulb, natural size. 4. Plant, natural size. 5. Part of stem × 8. 6. Gynaecium × 6. 7. Leaf, showing upper surface of medial leaflet × 6. (*Salter* 2454.) *Del.* T. M. Salter.

inclusa) exteriora 4—6 mm., glabra, interiora 6—8·5 mm. longa, longissima valde inaequalia, sparse glandulosa, anguste dentata. *Ovarium* globoso-ovoideum, 1 mm. longum, superne pubescens, ecallosum, loculis

1-ovulatis, stylis inferne pubescentibus, ad apieem sparsissime glandulosis.

Hab. Cape Provinee : Clanwilliam Div. ; Pakhuis Pass, about 2,800 ft., flowers May-July, *Salter* 2454 (*type* in Bolus Herbarium), 5399.

This speeies is remarkable for the colour of the corolla. The tube is a very deep purple and the lamina purple-red, the two colours being separated by a dull yellow ring in the throat. It is an affinity of *O. microphylla*, Schltr. ex R. Knuth and *O. Leipoldtii*, Schltr. In addition to the eolour of the eorolla tube, a charaeter which seems to be unique among the South African Oxalis, it differs from the former in its differently shaped leaflets, sepals and petals, in the nature of the hairs on the peduncle and in the teeth on the inner filaments, which are somewhat variable in length : from the latter in having shortly petiolate upper leaves and a glandular corolla, not dilated at the throat. (V.V.S., V.V.C.)

Oxalis senecta, Salter (Oxalidaceae), § Tripartitae (Oblongae).

Planta parva grisea, 2—4·5 cm. alta, caule non exserto, partibus herbaceis dense eano-villosis. *Bulbi* cumulati, tunicis numerosissimis papyraceis nitentibus laxe obteeti, exterioribus lanceolatis, apiee attenuato-aeieularibus, in dimidio inferiore diffissis, atro-brunneis, interioribus tenuissimis, pallidioribus. *Rhizoma* breve, graeile, squamis parvis semiamplexicaulibus indutum. *Folia* 9—25, basalia : petioli 1—2·5 em. longi, ad basin (infra articulum) valde dilati, membranaceo-squamiformes : foliola 3, petiolulata, tenuia, cuneata, antice $\frac{1}{5}$—$\frac{1}{6}$ ineisa, plerumque conduplicativa, supra glabra vel utrinque eano-villosa (in sicco), impressopunctata, ciliata, griseo-glauea, medium 4—6 mm. longum, 2·5—3·5 mm. latum, lateralia obliqua, paulo minora. *Pedunculi* uniflori, 2—3 cm. longi, ad apicem dense retrorso-villosi, paulo infra calyeem bibracteati braeteis linearibus alternantibus, villosis, pallidis, ad 4 mm. longis. *Sepala* late lanceolata vel ovato-lanceolata, 4—5 mm. longa, eiliata, ecallosa. *Corolla* 1·4—1·6 cm. longa, tubo breve late infundibuliforme luteo : petala e basi breviter unguiculata late cuneato-obovata, oblique subtruncata, infra ad marginem exteriorem dense cano-pilosa et rare purpureo-maculata. *Filamenta* (parte connata inclusa), exteriora 2·5—4·5 mm. glabra, interiora 4—7 mm. longa, minute glanduloso-pilosa, leviter gibbosa, longissima e corollae tubo satis exserta. *Ovarium* oblongum, 1·5—2 mm. longum, in dimidio superiore eano-pilosum, ecallosum, loculis circa 24-ovulatis : styli ad basin sparse pilosi, superne minute glandulosi.

Hab. Cape Province : Van Rhyn's Dorp Div. ; Knecht's Vlaagte,

12 miles north of Zout River Bridge on sandy banks of a dry watercourse, *Salter* 5490 (*type* in Bolus Herbarium) June 1935, 2510 July 1932.

Probably an affinity of *O. bella*, Knuth (*O. exigua*, Bolus f., non Phil.) and *O. Annae*, Bolus f., but a rather larger plant. It differs in having a dense coating of longish white simple hairs, longer leaflets and bulbs

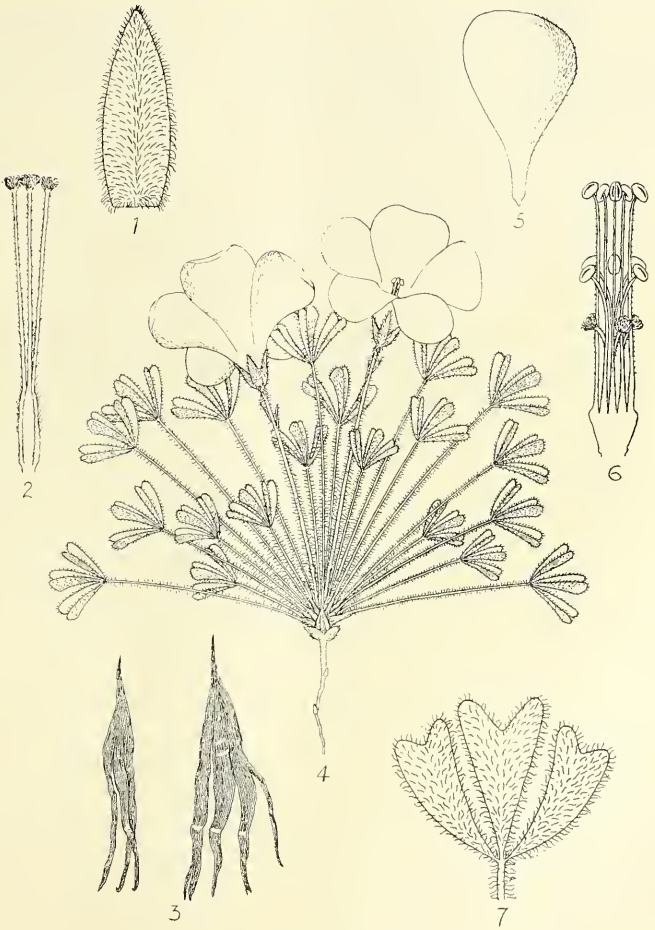

Fig. 8. *Oxalis senecta* Salter. 1. Sepal × 6. 2. Gynaecium × 6. 3. Bulb scales, natural size. 4. Plant × 1½. 5. Petal × 2. 6. Androecium × 6. 7. Leaf × 4. (*Salter* 5490.) *Del.* T. M. Salter.

enclosed in a dense mass of lanceolate scales which split in their lower part, similar to those of *O. minima*, Sond. The plants grow several together in tufts and the white indument overlying the greyish leaves gives them a hoary appearance. In this respect it resembles *O. densa*, N.E. Br., which is however a still smaller species with bifurcate leaflets and quite different bulbs.

It appears to be rare and it evidently lies dormant unless it receives favourable rains, for after first finding it in 1932, I was unable to discover any trace of it in the same locality during the two following seasons, but after good rains it appeared again in 1935.

AMPHISIPHON, A NEW GENUS OF LILIACEAE.

By Winsome F. Barker.

AMPHISIPHON, W. F. Barker, gen. nov. (Liliaceae-Scilleae).

Bulbus tunicatus. *Folia* radicalia. *Inflorescentia* perbrevis, congesta, multiflora, exinvolucrata, bracteis parvis. *Perianthium* connatum persistens : segmenta 6, quam tubus valde breviora. *Stamina* perianthium molto superantia ; filamenta in dimidio inferiore tubulari-connata, sine disco, e tubi perianthii medio exorientia. *Antherae* dorsifixae. *Ovarium* obtuse angulatum ; stylus erectus, subulatus, simplex, perianthium superans, stigmate minuto ; ovula biseriata, numerosa. *Capsula* ovoidea, membranacea, obtuse angulata, e basi septifraugens, in stylum persistentem attenuata ; semina rotundata.

Amphisiphon stylosa, W. F. Barker, sp. nov.

Bulbus globosus, tunicis saturate brunneis obtectus, diam. c. 3·5 cm. *Folia* 2—3, patentia, basi pedunculum usque ad 3 cm. amplectantia ; lamina ovato-lanceolata, acuta, long. c. 9·5 cm., lat. 4·2 cm., atro-viridis, nitens. *Inflorescentia* fragrans, racemosa, congesta, diam. 4 cm. ; pedunculum perbreve ; bracteae parvae, lanceolatae, membranaceae, long. c. 1 cm. ; pedicelli breves, inferiores, long. 3 mm. *Perianthium* long. 2·2 cm., diam. 2·5 mm. : tubus long. c. 2 cm., inferne circa usque ad 9 mm. longus, albus, superne viridi-luteus, fere long. 11 mm. ; segmenta erecta lutea in forma variabilia, long. 1·5 mm., gibbosa, apice minute papillosa. *Stamina* long. c. 2·3 cm., usque ad 1·5 cm. connata, paullo infra tubi medium exorientia ; partes liberae arcuatae, erecto-patentiae, laete flavae, long. c. 9 mm. *Antherae* flavae, dorsifixae, introrsae, post dehiscentiam long. 1·5 mm. *Ovarium* long. 6 mm., basi diam. 2 mm., loculis multi-ovulatis, in stylum longum attenuatum, stigmate minuto. *Capsula* membranacea, obtuse angulata, lat. 1·2 cm., stylo persistente. *Semina* atra, nitentia, long. 2·5 mm.

Hab. Cape Province : Calvinia Div. : 3 miles north of Nieuwoudtville, in flower 21st June, 1934, *Salter* 4552. Also *Salter* flowered in Nat. Bot. Gdns., Kirstenbosch, May 1935, 1558/34. (*Type* in Bolus Herbarium.) Locality uncertain ; flowered in Mrs. H. S. van Zijl's garden, Claremont, May 1921, *Bolus Herb.* 17137.

The district of Calvinia is rich in dwarf bulbous Liliaceous plants, for besides Amphisiphon, our new genus, Androsiphon, Polyxena, Massonia and Neobakeria are all found within its boundaries. The first two genera mentioned could easily be mistaken for one another at first sight, the

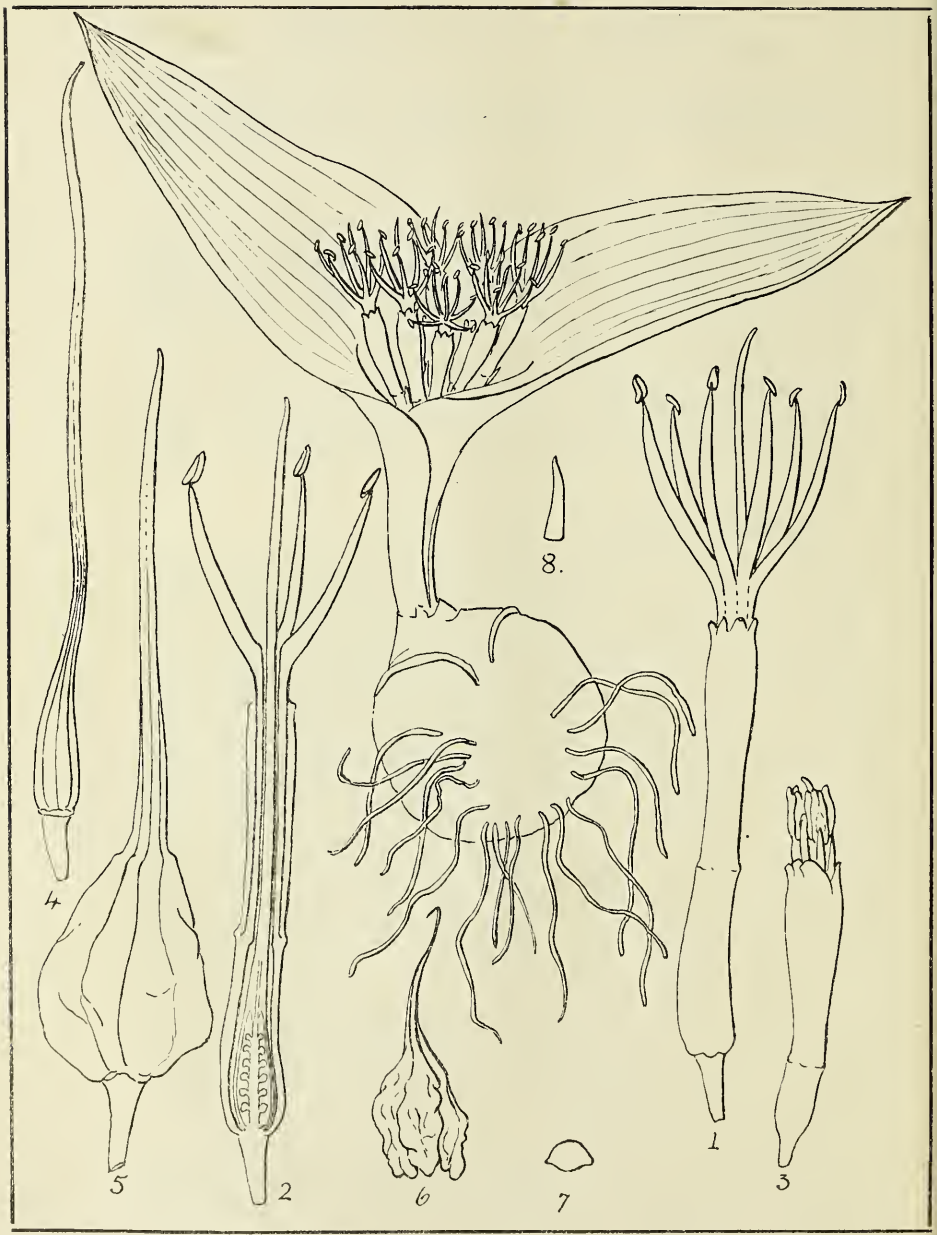

FIG. 9. *Amphisiphon stylosa*, Barker, natural size. 1. Flower × 3. 2. Longitudinal section of flower × 3. 3. Bud × 3. 4. Gynaecium × 3. 5. Young capsule × 3. 6. Ripe capsule, natural size. 7. Seed × 3. 8. Bract × 3. (*Nat. Bot. Gdns. Kirstenbosch* 1558/34.) *Del.* W. F. Barker.

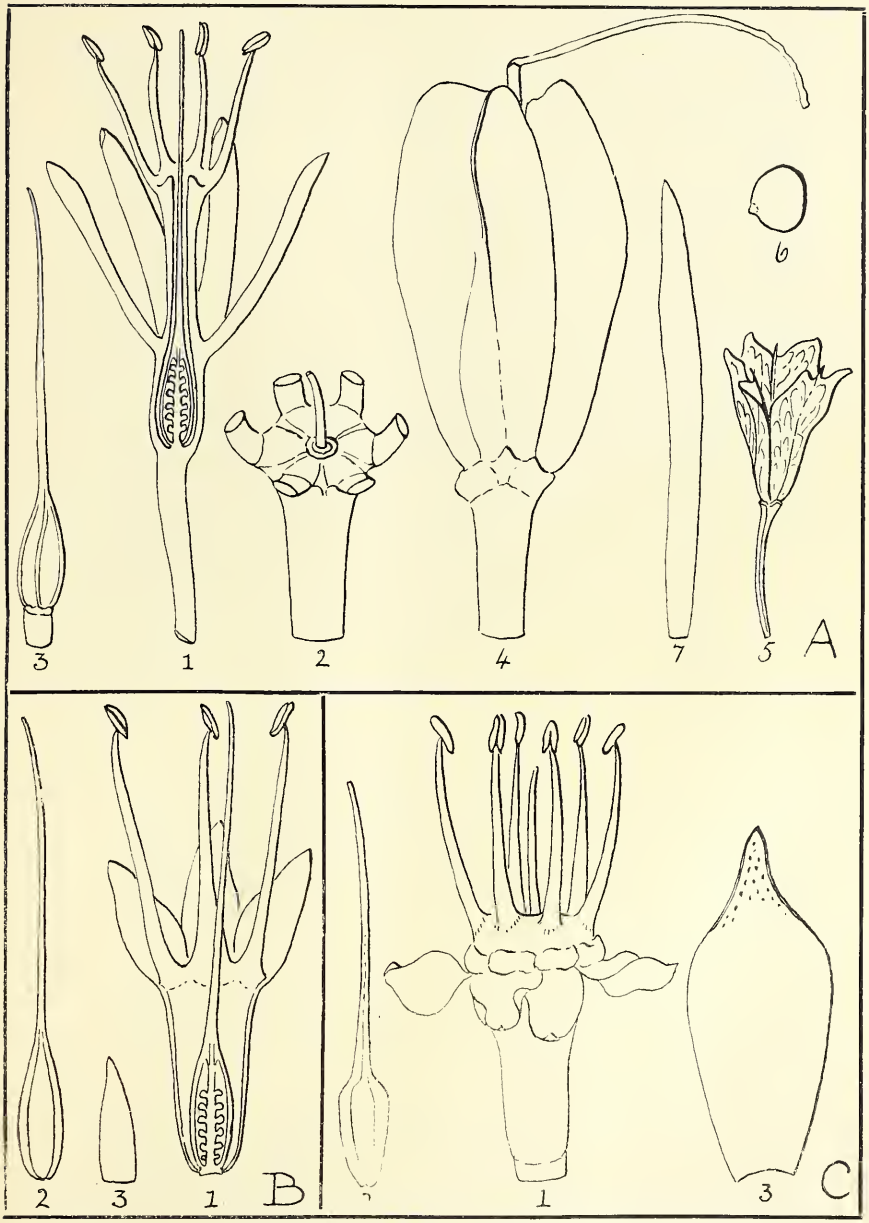

FIG. 10. A. *Androsiphon capensis*, Schltr. 1. Longitudinal section of flower × 3. 2. Portion of staminal tube showing disc × 6. 3. Gynaecium × 3. 4. Young capsule × 3. 5. Ripe capsule, natural size. 6. Seed × 3. 7. Bract × 3. (*Nat. Bot. Gdns. Kirstenbosch* 1531/26.) B. *Neobakeria haemanthoides*, Schltr. 1. Longitudinal section of flower × 3. 2. Gynaecium × 3. 3. Bract × 3. (*Salter* 4452.) C. *Massonia obovata*, Jacq. 1. Flower × 2. 2. Gynaecium × 2. 3. Bract × 2. (*Bolus Herb.* 20433.) *Del.* W. F. Barker.

habit and colour of the flowers being very similar, but apart from the fact that they usually are not in flower at the same time, they differ in several fundamental characters which are sufficient to make them generically distinct.

R. Schlechter published the genus Androsiphon in 1924, choosing the name on account of the long staminal tube. It is this character which links it to Amphisiphon, but while Androsiphon has relatively long spreading perianth segments, in Amphisiphon the perianth is tubular for a considerable distance above the insertion of the staminal tube, and the free segments are relatively short : the greater portion of the staminal tube is ensheathed within this prolonged perianth tube. The absence of a disc at the apex of the staminal tube which is so characteristic of Androsiphon is an important distinction. The difference in the capsules of the two plants is also very striking, that of Androsiphon being obovate, sharply angled at the top, leathery and dehiscing loculicidally, whereas in Amphisiphon the roundly angled membranous capsule is broadest at the base, and narrows gradually into the long persistent style, an unusual character within this group of genera, so far as known. In dehiscence the fruit drops from the pedicel, the three carpels then separate from the base upwards and finally each splits down the septum. Minor differences are the relatively much shorter pedicels and bracts and the smaller seeds in Amphisiphon. The flowers of Amphisiphon are scented and appear in June in the wild state, in May in cultivation, whereas those of Androsiphon flower in August-September in the wild state and in June in cultivation.

Another genus nearly related to Amphisiphon is Neobakeria. The latter has a long slender perianth tube, but differs in having a very short staminal tube adnate to the mouth of the perianth tube and the segments relatively large and spreading. Unfortunately the fruits in Neobakeria are more or less unknown except that in *N. namaquensis*, Schltr., of which we have immature material, the fruit is broadest at the base as in Amphisiphon, but the style withers away, the angles are acute and the dehiscence is down the loculus.

The base of the filaments in some species of Massonia are fused to form a fleshy disc-like tube which, however, is always short, but Massonia differs from all the allied genera by its reflexed perianth segments and its very broad involucral bracts.

Description.—Bulb globose, covered with dark brown scales, up to 3·5 cm. diam. *Leaves* usually 2 sometimes 3, spreading ; blade ovate-lanceolate, acute, up to 9·5 cm. long, 4·2 cm. broad, dark green, shining, with faint depressed lines down the face ; the base enfolding the peduncle for about 3 cm. *Inflorescence* fragrant, racemose, congested, 4 cm. diam. ;

peduncle very short; bracts small, lanceolate, membranous, up to 1 cm., long; pedicels short, the lower ones 3 mm. long. *Perianth* tubular, up to 2·2 cm. long; tube 2 cm. long, the lower part white for about 9 mm., the upper portion greenish yellow, nearly 1·1 cm. long; segments erect, yellow, variable in shape, 1·5 mm. long, gibbose, with a tuft of minute papillae at the apex. *Stamens* up to 2·3 cm. long, connate for about 1·5 cm., arising a little below the middle of the perianth tube; the upper part of the staminal tube is usually well exserted from the perianth and has a large drop of nectar resting in its mouth; the free parts are erecto-patent, arcuate, bright yellow, up to 9 mm. long. *Anthers* dorsifixed, introrse, yellow, 1·5 mm. long after dehiscing. *Ovary* 6 mm. long, 2 mm. diam., loculi multi-ovulate, the apex attenuate into a long style, which is bright yellow and finally exserted beyond the stamens and ends in a minute stigma. *Capsule* membranous, ovate, obtusely angled, laterally compressed parallel with the peduncle, 12 mm. diam.; style persistent; dehiscence septicidal from the base; seeds many, rounded, shining black 2·5 mm. long.

The measurements in the descriptions were taken from the cultivated plants: those in the wild are smaller in proportion.

NOTES ON SOME NEW ALOES FROM THE TRANSVAAL, WITH DESCRIPTIONS OF THREE NEW SPECIES, AND ONE NEW VARIETY.

(With three plates.)

By

G. W. Reynolds.

Especially in the Genus *Aloe* does the Transvaal present a wealth of material for the botanical worker. Considerable further investigation is however necessary, particularly in such richly succulent regions as the Zoutpansberg, Pietersburg, Middelburg, Lydenburg and Pilgrims Rest districts, before the Transvaal can be regarded as satisfactorily worked out in so far as the Aloes are concerned.

It is the author's hope to publish later in this Journal, a check list with localities, of the Aloes of the Transvaal, but before this can be attempted with any degree of accuracy and completeness it is advisable that the descriptions should first be published of such new distinct species as are at present known to exist. It might surprise some to learn that no less than 40 valid published *Aloe* species occur in the Transvaal, to which must be added three new species at present in the press,[1] and the three new species now described in this paper.

Since it is inadvisable to allow temporary manuscript names to get into circulation, only brief reference will be made to the following further new species :—

1. *Aloe* sp. (in Section *Leptoaloe*), from near Louis Trichardt in the Zoutpansberg.
2. *Aloe* sp. (in Section *Leptoaloe*), at present known as " Thompson's Aloe " from the Wolkberg, Pietersburg District.
3. *Aloe* sp. (in Section *Saponariae*), collected by Dr. E. E. Galpin, F.L.S. and Mr. L. R. Vogts, near Lake Fundusi, Zoutpansberg.
4. *Aloe* sp. (in Section *Saponariae*), collected by the writer near Badplaats, Carolina District, East Transvaal.

It is hoped that these species will be figured during their approaching flowering season, and described for early publication. It can thus be stated that at least 49 distinct *Aloe* species occur in the Transvaal, of which 23 species appear to be peculiar to this province. The following new species are described in this paper for the first time.

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[1] *Aloe mutans*, Reynolds ; *Aloe integra* Reynolds ; *Aloe pongolensis*, Reynolds, figured and described for publication in a forthcoming part of *Flowering Plants of South Africa.*

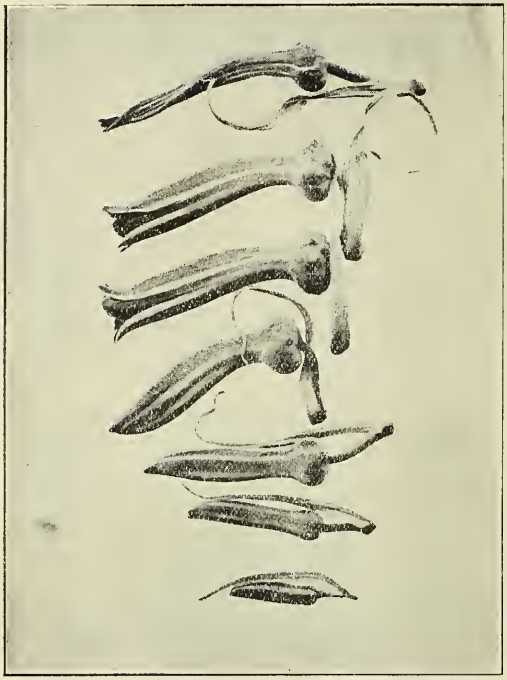

Fig. 2.

PLATE 1.—*Aloe comosibracteata*, Reynolds.

Fig. 1. Plant in natural habitat, near Nelspruit, East Transvaal, flowering 17th July, 1935.

Fig. 2. Flowers natural size, from the bud to the post-pollination stage.

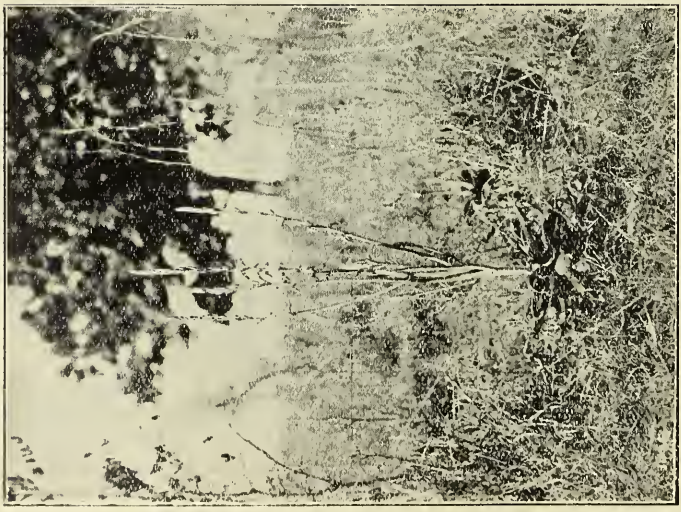

Fig. 1.

Aloe comosibracteata, Reynolds ; species nova in sectione *Saponariarum*, *A. barbertoniae* Pole Evans, et *A. longibracteatae*, Pole Evans, affinis. *Herba* succulenta, acaulis. *Folia* 15—20 dense rosulata, erecto-patentia, lanceolato-attenuata, usque ad 15 cm. longa, 6—8 cm. lata ; supra planiuscula vel leviter caniculata, viridia, maculis oblongis irregulariter fasciatim picta ; subtus convexa, immaculata vel obscure maculata ; ad margines sinuato-dentata dentibus deltoideis corneis pungentibus, linea cornea junctis, 3—5 mm. longis, ca. 10 mm. distantibus ; succus foliorum purpurascens. *Inflorescentia* 1—1·5 met. alta ; scapus plerumque infra medium ramosus, rami 4—9. *Racemi* cylindracei, elongati, laxi, leviter acuminati, usque ad 60 cm. longi, superne densi. *Bracteae* deltoideo-acuminatae, carnosae, plurinervae, scariosae, pedicellos quadruplo longiores ; *pedicelli* 10—15 mm. longi. *Perigonium* 39 mm. longum, basi inflatum (11 mm. diam.), supra ovarium valde constrictum (6 mm. diam.), decurvatum et faucem versus ampliatum ; segmenta exteriora per 11 mm. libera, marginibus pallidioribus, apice paullum recurvula, interiora obtusiora. *Genitalia* vix vel brevissime exserta. *Ovarium* 9 mm. longum, 4 mm. diam.

Hab. Transvaal : Barberton Dist. near Nelspruit, fl. 17/7/35 ; Reynolds 1454 (*type*) in National Herbarium Pretoria and in Bolus Herbarium, Kirstenbosch ; plant 446/9/35 in garden of the Botanical Laboratories, Pretoria. (Plate I.)

This species was photographed and collected by the author, near Nelspruit, in the Barberton district, on 17th July, 1935, and also noticed northwards near Brondal Siding, westwards along the Schagen road, southwards to Barberton, and repeatedly in the neighbourhood of Barberton, especially near Clutha Siding and Noordkaap. It frequently grows in association with *A. barbertoniae* Pole Evans, with which species it often crosses, but is readily distinguished by the considerably longer, very fleshy bracts, the peculiar frosted-pink coloured flowers, and especially by the racemes terminating with a densely imbricate tuft of fleshy bracts, on which account the above name is proposed. The rosette of leaves is somewhat similar to that of *A. barbertoniae*, in which the buds are not obscured by their bracts, whereas in *A. comosibracteata* the buds are completely hidden, with the lowest flowers much more distantly spaced.

Another near ally is *A. longibracteata* Pole Evans, which it somewhat resembles in long bracts, and bracts tufted at apex of racemes,[2] but differs with slightly longer, narrower racemes, the lowest flowers shorter and more distantly spaced, the tube comparatively longer and the frosted-

[2] *Vide* Trans. Roy. Soc. S. Af., Vol. V., Pt. 1, June 1915, Plate V, fig. 2.

pink colour of the perianth. *A. longibracteata* has leaves greener, more triangular-lanceolate, and often as long as broad, much stouter marginal teeth, stouter peduncle, which usually has three to four branches only, while *A. comosibracteata* has longer, more attenuate leaves of a more brownish-green ground colour, a slendcrer peduncle, and a taller more branched inflorescence. Solitary plants occur wild, while groups from suckers do not appear to occur.

Description.—Herb succulent, stemless or rarely up to 20 cm. *Leaves* 15—20 densely rosulate, up to 15 cm. long with an additional 5—10 cm. of dry twisted apex, 6—8 cm. broad, lanceolate-acuminate, erectly spreading, sometimes horizontally disposed and slightly recurved ; upper surface rather flat low down, more concave near apex, palcr green near base, more brownish nearer apex, with dull white oblong spots arranged in irregular broken, wavy transverse bands ; lower surface convex, usually unspotted ; the margins sinuate-dentate, with brown deltoid thorns 3—5 mm. long, about 10 mm. distant, the interspaces corneous, brown, rounded. *Inflorescence* 1—1 ·5 met. high, branched below the middle, with 4—9 branches, the lowest sometimes with branchlets, and subtended at base by rather fleshy bracts 10 cm. long, 3 cm. broad, armed with a few marginal teeth near apex ; *peduncle* terete, flattened low down, covered with a greyish powdery substance. *Racemes* the terminal up to 60 cm. long, lateral ones shorter, cylindric-acuminatc, very laxly flowered with lowest flowers up to 8 cm. distant, gradually denser upwards, the buds obscured by densely imbricate tufted bracts forming an acute apex. *Bracts* the lowest 3—4 times the length of the pedicels, deltoid-acuminate, rather fleshy, many nerved, usually curled and twisted in upper portion. *Pedicels* up to 15 mm., gradually shorter upwards. *Perianth* frosted-pink, 39 mm. long, swollen at base (11 mm. diam.) sharply constricted above the ovary (6 mm. diam.), thence decurved and enlarging towards the throat, slightly compressed laterally and with a slightly upturned mouth ; outer segments free for 11 mm. from apex, with a 1—1 ·5 mm. broad white marginal border, and with sub-acute, slightly spreading apices ; inner segments broader, with spreading more obtuse apices, and with broader white marginal border than the outer. *Filaments* flattened, the 3 inner narrower and lengthening in advance of the 3 outer. *Anthers and stigma* not, or very shortly exserted. *Ovary* 9 mm. long, 4 mm. diam. at base, slightly tapering into the style, finely 6-grooved. The leaf sap dries purplish-violet.

Aloe laxissima, Reynolds, species nova et distincta in sectione *Saponariarum*, floribus similibus eis *A. zebrinae* Bak., sed racemis laxissimis et succo foliorum purpurascente facile distinguitur. *Herba* succulenta,

Fig. 1.

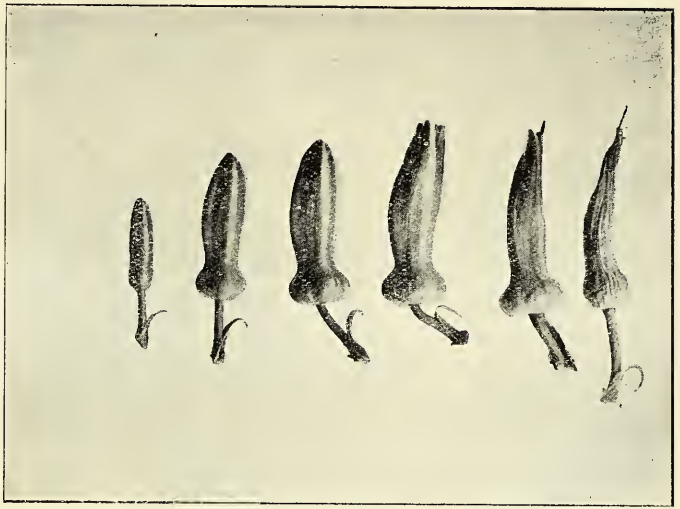

Fig. 2.

PLATE H. *Aloe laxissima*, Reynolds.

Fig. 1.—*Aloe laxissima*. Two plants collected by the author near Nebo, Middelburg District, flowering in his garden, 28th March, 1935.

Fig. 2. Flowers natural size, from the bud to the post-pollination stage.

acaulis vel breviter caulescens, sobolifera, mox caespitosa. *Folia* 15—20 dense rosulata erecto-patentia, e basi 5·5—7 cm. lata, sensim acuminata usque 30 cm. longa; supra planiuscula vel leviter caniculata, viridia, maculis oblongis irregulariter fasciatim picta; subtus convexa, maculata; ad margines sinuato-dentata, dentibus deltoideis corneis 5 mm. longis et 10—15 mm. distantibus. *Inflorescentia* 1—1·7 met. alta, scapus medio ramosus, rami 5—8, ramis arcuato-erectis; *racemi* cylindracei, elongati, laxissimi usque ad 25—50 cm. longi. *Bracteae* deltoideo-acutae, scariosae, plurinerviae, pedicellos aequantes; *pedicelli* 10—12 mm. longi. *Perigonium* 30 mm. longum, basi manifeste inflatum (11 mm. diam.), supra ovarium valde constrictum, levissime decurvatum et faucem versus ampliatum, segmentis oblongis, 10 mm. longis, marginibus pallidioribus; *genitalia* vix vel brevissime exserta.

Hab.: Transvaal, District Middelburg, near Nebo, fl. March-April, 1935; Reynolds 767 (*type*) in National Herbarium, Pretoria, and Bolus Herbarium, Kirstenbosch; Plant 999/35 Nat. Bot. Gardens, and 448/9/35 in Garden of Botanical Laboratories, Pretoria. (Plate II.)

The species is described from plants collected by the author near Nebo, about 85 miles north of Middelburg, East Transvaal, and which flowered in Johannesburg during March and April, 1935. It is plentiful near Nebo and so far as is at present known appears to be confined in its distribution to that neighbourhood. Its nearest ally seems to be *A. zebrina* Bak. from which it differs with smaller weaker marginal teeth, a more divaricately branched inflorescence and laxer racemes. In shape and size, the flowers of *A. laxissima* closely resemble those of *A. zebrina*,[3] but the colour of the perianth is a peculiar frosted-pink; the leaf sap dries reddish-violet, while Baker's species is described with "*succus foliorum flavens.*"

The Nebo species also seems near *A. Simii*, Pole Evans,[4] but differs with shorter, broader perianth, distinctly reflexed bracts, and especially with leaves spotted in rows on both surfaces.[5] Apart from the short, broad, frosted-pink flowers, a striking feature of the species is the very loosely-flowered racemes, which suggests the above specific epithet.

Description.—Herb succulent, acaulescent or shortly caulescent, soboliferous, soon forming dense groups. *Leaves* 15—20, densely rosulate 25—30 cm. long, with an additional 5 cm. of dried twisted apex, 5·5—7 cm. broad, linear-lanceolate, acuminate from the middle, erectly spreading; upper surface flatter near base, more concave near apex, dull

[3] Engler: Das Pflanzenreich, Liliac.-Asphodel.-Aloin. (1908), p. 207, figs. D-E.

[4] *Vide* Trans. Roy. Soc. of S. Af., Vol. V, Pt. 6, 1917, Plate LI, figs. 1-2.

[5] *A. Simii* appears to be untraceable to-day, and is a species unknown to the Author in the living state.

green and ornamented with numerous dull whitish blotches, which are more or less confluent into a series of irregular transverse bands ; lower surface convex with the blotches less defined than the upper surface and arranged in broader, slightly more obscure bands ; the margins sinuate-dentate, armed with deltoid brown tipped deflexed teeth 5 mm. long, 10—15 mm. distant, the interspaces rounded. *Inflorescence* 1—1·75 met. high, divaricately branched from the middle upwards, usually with 5—8 arcuate-erect branches, the lowest sometimes with branchlets, a second inflorescence appearing after the first ; *peduncle* rather slender, terete, flattened low down ; *racemes* 25—50 cm. long, very loosely flowered with the lowest flowers up to 30 mm. apart, gradually slightly denser upwards, with the buds 20 mm. apart, the terminal raceme higher than the others, the lateral racemes shorter. *Bracts* as long as the pedicels, deltoid-acuminate, scarious, many nerved, spreading in the bud stage, sharply deflexed in the expanded flower stage ; *pedicels* 10 mm. long, lengthening to 14 mm. in the fruit stage. *Perianth* frosted-pink, 30 mm. long, conspicuously sub-globosely inflated at base (11 mm. diam.), severely constricted above the ovary (7 mm.), decurved and enlarging towards the throat (10 mm.), slightly compressed laterally and narrowing to about 7 mm. at mouth ; outer segments free for 10 mm., the free portion with white marginal border 1—1·5 mm. wide, with 5—7 dull pink nerves confluent at apex, the segment apices sub-acute, scarcely spreading ; inner segments free, but cohering dorsally to the outer for two-thirds their length, with broader more obtuse apices, the white marginal border twice as broad as the outer, and with about 10 obscure crowded nerves confluent at apex. *Anthers* not, or very shortly exserted. *Stigma* at length exserted 1—2 mm.

Aloe burgersfortensis, Reynolds, species nova in sectione *Saponariarum*, *A. transvaalensi* O. Kuntze affinis, sed floribus minoribus differt. *Herba* succulenta, acaulis, sobolifera, mox caespitosa. *Folia* 10—20, dense rosulata, erecto-patentia, carnosa, plerumque ad apices langues-centes, lanceolata sensim acuminata, 20 cm. longa, 5—7 cm. lata ; supra subcaniculata, viridia vel rubescentia, maculisque oblongis albidis irregulariter fasciatim seriatis picta ; subtus convexa et pallide glauco-viridia, immaculata ; ad margines sinuato-dentata dentibus deltoideis corneis pungentibus, linea cornea junctis, 3—5 mm. longis, 10—14 mm. distantibus. *Inflorescentia* 1—1·3 met. alta ; scapus supra medio ramosus, rami 4—9, arcuato-erecti. *Racemi* cylindracei, laxiusculi, 20—35 cm. longi. *Bracteae* deltoideo-acuminatae, plurinerviae, scariosae, 12—18 mm. longae ; *pedicelli* 10—15 mm. longi. *Perigonium* 28 mm. longum, basi globoso-inflatum et 7 mm. diam., supra ovarium constrictum et

Fig. 1.

Fig. 2.

Fig. 3.

Plate III. *Aloe burgersfortensis*, Reynolds, spec. nov.

Fig. 1. Group of plants in natural habitat, near Burgersfort, flowering 21st July, 1935, typical.

Fig. 2. Flowers natural size, from the bud to the post-pollination stage.

Fig. 3. A stronger, less suckering form, photographed near Steelpoort, about 50 miles north-west of Lydenburg, flowering 21st July, 1935.

decurvatum, faucem versus ampliatum ; segmenta exteriora per 7 mm. libera, marginibus pallidioribus ; segmenta interiora latiora, obtusiora. *Genitalia* vix vel brevissime exserta.

Hab. Transvaal : Lydenburg District, at Buffelsvlei, fl. 21/7/35, Reynolds 1465 (*type*), Steelpoort, Reynolds 1471, Burgersfort, Reynolds 1474, all in National Herbarium Pretoria, and Bolus Herbarium Kirstenbosch ; plants 382 and 384/8/35 in Garden of Botanical Laboratories, Pretoria, and 1465/35 in National Botanic Gardens, Kirstenbosch. (Plate III.)

This species occurs in considerable quantities in the bushveld of the Lydenburg District ; it is found in the Waterval Valley about 24 miles North-west of Lydenburg, at Buffelsvlei and the Waterval River causeway, Northwards to Burgersfort (48 miles from Lydenburg) and beyond. It is plentiful near Steelpoort and Eastwards along the Steelpoort River. A very dense colony of many thousands occurs on a rocky rise about one mile East of the Spekboom River near Burgersfort ; at this locality and elsewhere it is often found growing in association with *A. Marlothii*, Berg., *A. castanea*, Schonl., *A. Pienaarii*, Pole Evans, *A. Wickensii*, Pole Evans, and *A. globuligemma*, Pole Evans, and with these species all flowering at the same time, the country thereabouts presents a most memorable blaze of colour during July and August. *A. burgersfortensis* has affinities with *A. transvaalensis*, O. Kuntze, and *A. Fosteri* Pillans ; from the former it differs in thinner leaves, not spotted below, shorter differently shaped perianth and flowering period, while *A. Fosteri* is a much larger plant with much longer attenuate leaves of a characteristic blueish-grey ground colour, with a more branched inflorescence and longer denser racemes. *A. transvaalensis* usually flowers from January to March, *A. Fosteri* in March—April, while *A. burgersfortensis* is in full bloom usually from the latter part of May to about the middle of August.

The species is variable in leaf, length shape and colour of flowers, and is described from observations made at the above localities in July 1934 and July 1935.

Description.—Herb succulent, stemless, freely suckering and soon forming dense groups, occasionally solitary. *Leaves* 10—20, densely rosulate, erectly-spreading, up to 30 cm. long with an additional 10 cm of dried twisted apex, 5—7 cm. broad at base, gradually acuminate ; upper surface brownish-green, sub-caniculate, with oblong scattered white spots arranged more or less in a series of wavy interrupted transverse bands ; lower surface convex, paler glaucous-green, somewhat lineate, usually immaculate ; the margins sinuate-dentate with firm horny deltoid brown pungent teeth 3—5 mm. long and 10—14 mm.

distant, the interspaces rounded. *Inflorescence* mostly 1—1·3 met. high, usually compactly branched above the middle, with 4—9 slender arcuate-erect branches, the lowest sometimes with branchlets; *peduncle* terete, slender, flattened low down. *Racemes* cylindric-acuminate, 20—35 cm. long (sometimes up to 40 cm.), somewhat loosely flowered, the central terminal raceme usually longer than the others, the lateral racemes slightly shorter. *Bracts* deltoid-acuminate, thin, scarious, many nerved, slightly longer than their pedicels; *pedicels* 10—15 mm. long, lengthening up to 20 mm. in the fruit stage: *flowers* reddish, somewhat white striped in upper half, sometimes shading to orange at mouth. *Perianth* 28 mm. long, sub-globosely inflated at base (6 mm. diam.) constricted above the ovary (4 mm. diam.), thence decurved and enlarging towards the throat, slightly compressed laterally: outer segments connate into a tube for three-quarters their length, the free portion 7 mm. long and with a white 1 mm. wide marginal border, the apices subacute and slightly spreading; inner segments broader, and with more obtuse more spreading apices. *Filaments* flattened, the 3 inner narrower and lengthening in advance of the 3 outer. *Anthers* not, or very shortly (1 mm.) exserted, the 3 inner dehiscing in advance of the 3 outer. *Stigma* at length exserted 1 mm.

Aloe Marlothii Berg, var. **bicolor,** Reynolds, varietas nova, distincta et pulcherrima, ab typo dentibus rubris, alabastris rubris, floribus albis, racemis bicoloris differt.

Hab. Transvaal: Barberton District, fl. 14/7/35, 8 miles North-west of Barberton on the Carolina road, Reynolds 1440 (type), in Nat. Herb. Pretoria.

This very handsome variety occurs abundantly in warm valleys of the Barberton district, Eastern Transvaal low-veld. It is plentiful near Barberton, for some miles along the Carolina road, Northwards towards Nelspruit, North-eastwards at Clutha Siding, Noordkaap, and beyond. It flowers usually in June-July, and appears to be restricted in its distribution to the neighbourhood of Barberton. In general habit of growth it differs little from the typical form,[6] but is readily distinguished by the red buds and greenish-white flowers forming very pleasing bi-coloured racemes. In the varietal form the spines are much redder than usual. It is a most attractive plant, very suitable for large rockeries, and one well worth cultivating.

Description.—Differs from the typical form with leaves less spiny, with red (not brown) spines and marginal teeth, with red buds and greenish-white flowers forming distinctly bicoloured racemes, otherwise in general habit of growth, development of stem, size of rosette, as the typical form.

[6] *Vide* "*Aloe Marlothii*, some Forms and Hybrids" in Journal of the Botanical Society of S. Africa, Part XXI, 1935.

FIRE IN VEGETATION: A BAD MASTER, A GOOD SERVANT, AND A NATIONAL PROBLEM.

By John Phillips.

Fire in vegetation is a subject of interest to all South Africans, and one upon which the man in the street considers himself adequately informed. If he has not seen for himself the ravages of fire, he has been instructed in print and by lecture that firing of vegetation is always highly destructive, and is to be considered as an act of vandalism against the national heritage. Few subjects of national interest in the Union have received more popular attention in recent years, and few have been dismissed with so definite an expression of opinion by some scientific workers and by an enthusiastic circle of the general public—that circle, chiefly resident in towns, and rightly interested in, and proud of the beautiful array of flowering plants found in the flora of South Africa. Needless to say that opinion is strongly against firing.

Largely resulting from the interest exhibited by the present Government in the national problems of veld conservation and improvement, the matter of the firing of vegetation has received renewed attention recently. It is because of this renewed interest that I attempt to deal briefly and simply with several aspects of the general problem. I dealt (Phillips 1930) some years ago, in a paper delivered to the South African Association for the Advancement of Science with a number of the influences of fire upon biotic communities in South and East Africa. I now propose to deal briefly and simply with several aspects of the problem, and shall confine my attention to considering in summarized form the evil and the beneficial influences of fire in vegetation, and to a suggestion regarding the control of fire. My hope is that my comments may call for discussion in the future, discussion based upon definite experimentation.

That the interrelations of fire, vegetation, habitat conditions, water conservation and management of various classes of vegetation provide a vast field for research of academic and practical nature, must be emphasized. Work in various regions, in various localities in each region, and at various seasons must be accomplished, and the results carefully co-ordinated and interpreted before we can possess information upon many points at present obscure.

Some work has been done by workers at the University of Cape Town, Cedara and Potchefstroom Schools of Agriculture and the Botanical Research Station, Frankenwald, University of the Witwatersrand, in recent years, but this requires to be continued and to be developed and augmented. It is to be remembered, too, that in Nature the interrelation

of grazing and browsing with fire, in terms of season, frequency of firing, and many other features, is a fundamental one, and must be given special attention. Unless such attention be given *pari passu* with the study of other aspects of the problem, data of practical value are not likely to emerge for the pastoral policies of the State and the individual.

Fire as a Bad Master.

Fire is a decidedly bad master when it is responsible for—

(1) *Destruction or deterioration of vegetation* definitely valuable from one point of view or another. For example, valuable for its own intrinsic worth, as in the instances of timber, crops, pasturage, or because it preserves the amenities of a locality; as in the instances of vegetation acting as a conserver of water, and of a protection forest preventing landslides and erosion upon steep slopes.

(2) General or specific *deterioration of the physical factors of the habitat*, a deterioration brought about either directly or indirectly through the destruction or serious deterioration of vegetation.

(3) *Destruction or deterioration of aesthetic features* of a region, landscape, or locality.

For the sake of completeness I summarise a few examples under their appropriate heads :—

(1) destruction or deterioration of vegetation.

Fire may act destructively because it destroys or impairs the value of a given plant community, and/or of the crop yielded by that community. At the same time, it may act harmfully in that it puts back to an earlier stage the ecological status of the community: a more advanced stage being replaced by a stage much, or somewhat, earlier in the plant succession. Again, it may bring about an undesirable change in the floristic and community structure of vegetation, by destroying or inhibiting development selectively, or by aiding germination, and growth from root-suckers and stump-coppice, in some species but not in others.

While fire is used in sylvicultural practice with some forest species such as teak (Tectona), it may be looked upon as generally detrimental in its effects upon South African native forest. From the work of the Union Forest Department, it appears, too, that the use of fire in wattle culture in Natal is followed by deterioration of soil and of stand. I have outlined elsewhere (Phillips 1930) the great diminution in area of forest and scrub, as the result of the ravages of fire and axe; I should like to record that further observations in various portions of the Union

strengthen my earlier view that woody growth of forest and scrub nature has shrunken appreciably in area during the past half century to several centuries. At the same time, I wish to advise against the general acceptance of views sometimes put forward that large portions of grass savanna, and tree-and-grass savanna in the Transvaal, Natal and the Cape Province, once—in present geological time—were under high forest. There is no field or other evidence to support such contentions. More high forest and scrub forest there undoubtedly was in various mountain and other regions of the Union—and in such sites relict stages of such vegetation still persist to tell the story ; great have been the destructive influences of fire in such localities. But to claim more than this in terms of earlier extent of forest and scrub in present geological time, or in terms of the ravages of fire, cannot be supported on the facts available.

In tree-and-grass savanna of various types, and in grass savanna of probable climax nature (that is, the vegetation will develop no further than a grass stage, under present climatic conditions), it is becoming more evident as work is done upon the interrelations of fire and constitution of the grass flora, that fire may either destroy, retard, or accelerate the development of certain species. What is equally important, however, is that the season of the year and the frequency of firing over the years appear to play a fundamental rôle in this connection. Destruction of a species, or its appreciable reduction in extent, may follow on firing at one season, whereas spread of the species may result from firing at another season. In this respect the data being obtained for Themeda (Rooigras) at Cedara, Potchefstroom School of Agriculture, and the University of the Witwatersrand are worthy of serious consideration in connection with the use of fire in pasture-management, and the extension of experimental work of similar nature to other important species. Information collected by American workers goes to support observations being made in South Africa that firing may—according to season and frequency, and type of veld and its pastoral management—result in deterioration in terms of incoming of undesirable annual and perennial grasses, and a " weed " flora. As it is being shown, however, that judicious use of fire—along with proper management—may result in reduction of undesirable grasses and other plants and the incoming of more desirable grasses, and that the complete withholding of fire may spell deterioration in quality of veld and the influx of undesirable woody growths, it is clear that it is unfair to argue that fire in grass veld or tree-and-grass savanna is always harmful. The factor of management of the grazing after fire is so important that investigation of influences of firing, not taking cognisance of this, and not providing for the control of this process, must largely prove abortive. This aspect has well been

shown and described by Schönland (1927) in his work on the " Amatola Weed " (*Helichrysum argyrophyllum*) ; his recent press statements (1935) that the control of Rhenosterbos (*Elytropappus rhinocerotis*) by fire is possible, provided there is adequate grazing control, are further enlightening in this respect.

" Fijnbos " (macchia or maquis of the S.-W. Cape) vegetation, in almost all of its types productive of some of the most beautiful flowers of our flora, has suffered severely by annual ravages by fire. To this undoubtedly unfortunate fact is due much of the agitation against veld firing. It is a melancholy fact that some forms have disappeared entirely, and that others rapidly are becoming more and more rare ; forms resistant to fire, and even benefitting from the stimulus given their cambium to produce fresh shoots, are becoming more abundant ; unfortunately, such resistant forms are not always the more beautiful ones. Early sprouting and flowering of bulbous forms, some of them with showy flowers (such as various Iridaceae, Liliaceae, Amaryllidaceae, Orchidaceae) by some is claimed as a compensation for the formation in fijnbos of a blackened wilderness of charred stems and branches ; it surely is a poor one at best. Firing does, of course, temporarily improve the browse and grazing, poor in the best of conditions—hence its being practised by owners of sheep and other stock. Lack of attention to season of firing, and frequency of repetition, however, probably result in gradual deterioration of browse and grazing—a point requiring experimental work in various types of fijnbos. The results of work being conducted by Adamson and Levyns in regard to fire and fijnbos are awaited with interest.

Destruction of exotic vegetation requires no special comment, except that it is necessary for us to remember that our increasing plantations of exotic trees call for the awakening of a national consciousness as regards their protection against fire. Through various forestry and sylvicultural difficulties which need not be mentioned here, the Forestry authorities of the Union largely have to rely upon plantings of highly inflammable conifers, the protection against fire of which is by no means an easy task. Plantations of Eucalypts (Gums), although frequently devoid of vegetation beneath their own canopy, owing to their strong reaction upon soil-moisture, are liable to scorch and burn readily ; development of fresh growth from adventitious buds, however, usually follows rapidly and profusely from a fire. The use of Gums for living fire-breaks, in my opinion, is strongly undesirable, because to me they appear to be more in the nature of " fire-traps " than " fire-guards." Fire sweeping through plantations of exotic Acacias (such as *A. mollissima*, *A. dealbata*, *A. decurrens* (Green Wattle), *A. melanoxylon* (Blackwood)) produces the undesir-

able effect of strong reduction in organic matter, which reduction is certainly a cause cognate with that of the reaction of the trees themselves, in reducing water content of the soil, through removal of the water-absorbing, water-holding mulch of decomposed and undecomposed wood and leaf litter. Chemical ingredients in the litter are lost, to some extent, in the gaseous form during combustion, and possibly also by subsequent blowing by wind and washing by water, of the inorganic ash.

(2) DETERIORATION OF HABITAT.

As I have elsewhere (Phillips 1930) discussed in some detail the influence of fire upon aerial and soil factors, and as a really adequate additional treatment would require much space, and indeed still requires much more analytical work by physicist, chemist, and soil-biologist, I confine myself to a few general observations.

Firing invariably—if for a short period only—results in the aerial factors of greater importance—light-intensity, sun-temperature, true aerial or shade-temperature, humidity, wind-rate, evaporativity (the complex of light, heat, humidity, wind)—being made more severe than they were before the fire, upon the surface of the soil. Soil temperature (surface, and to a depth of several inches), organic matter, acidity, water-supplying-power, and total chemical solutes available to plants, are caused to change to a greater or lesser degree. Soil organisms—notably soil bacteria, fungi, protozoa, earthworms, and insects—in the upper layers, are influenced directly by the heat of the fire, or indirectly by the change in aerial and soil factors following removal of the vegetation cover. Frequently such physical, chemical and biological changes are in the direction of deterioration, although, as mentioned later, certain classes of soil over-charged with organic matter undoubtedly derive benefit from being fired at well spaced intervals.

While edaphic changes proper are of great importance to the forester, the agriculturist and the pastoralist, it is principally through an increase in rate of run-off of water and a decrease in rate and extent of water-absorption by the soil, that fire brings about major deterioration in a locality. Removal of vegetation, or its thinning, by fire is the first stage helping rain water to rush down slopes, or flow relatively unabsorbed over indurated soil of more level nature ; burning of the organic matter zone in the uppermost layers of the soil is the next stage. While vegetation and organic matter destruction may spell temporary and local increases in run-off, benefitting for a short time streams, rivers, and vleis, it is quite clear that supplying-power of the site, for water courses and water bodies for which it forms the catchment, is greatly reduced in terms of amount at any given period, and of efficiency during periods of prolonged drought.

Rapid run-off, as is well known, is accompanied by sand, silt and solutes, leading to a physical and chemical impoverishment of the soil.

It is because of the alteration by fire of the balance between water lost and water absorbed, and later steadily supplied, that the firing of vegetation in water catchment regions—such as mountain tops and slopes, valleys and along river courses—is so strongly deprecated. *Such regions should not be "farmed," for farming in South Africa is too frequently associated with either uncontrolled firing of vegetation, or over-stocking—both practices resulting in diminution of the water-supplying capacity of springs and other sources of water.*

Induration of the soil surface by fire, aided by temperature, humidity, and evaporation conditions following on its exposure to full insolation, not only is undesirable on account of its assisting rapid run-off of water, but because of the physical obstacle it sets to radicles of germinating seeds.

With regard to the often debated matter of early and very dense growth of grass and other shoots upon fired areas, as contrasted with the phenomena presented on unfired areas adjacent, observations made by my students and myself since 1931 go to support the view that this is no illusion, and probably is due to increased physiological activity in the direction of utilisation of root-reserves, in response to higher temperature conditions during the day, on the exposed and blackened soil of fired areas.

(3) DESTRUCTION OR DETERIORATION OF AESTHETIC FEATURES.

As has been indicated already, fire has caused loss of beautiful plants, more especially in the fijnbos of the South-Western Cape. Year by year we are becoming more conscious of the glory of the floral wealth of our country, in its various types. If in detail many of the plants of the more arid portions are not spectacular in their form and colour, we are beginning to appreciate the general effect produced by natural vegetation upon ranges of hills, on kopjes, and lining valleys and water courses. Fire, coupled with a somewhat careless farming practice, undoubtedly is converting many aesthetically charming vegetation and landscape vistas into untidy, unsightly, much scarred spectacles. The most ardent advocate of the benefits of using fire in veld management scarcely could subscribe to the annual burning off of vegetation upon areas of scenic attraction, where frequently the grazing to be won by the firing is of a very low order anyway.

FIRE AS A GOOD SERVANT.

Controlled firing of vegetation, controlled in regard to season and frequency, for a given class of vegetation within a given climatic or soil region, undoubtedly has much to be said in its favour.

It is the avowed policy of the Union Department of Agriculture to develop the pastoral industry. Such development calls for a fundamental improvement in present methods of browsing and grazing of natural vegetation. Important aids to production of better natural pastures—that is naturally established and not planted or sown vegetation, even if of South African plants—are known to be the following :—(1) Controlled grazing, with adequate provision for rotation and rest ; (2) fertilizing, to improve the quality and increase the quantity of growth ; (3) superficial cultivating of the soil, so as to improve conditions for basal spread of grasses : (4) mowing, to provide food for winter, but also to prevent grass from becoming too tall, too rank, and from developing, by process of plant succession, to less and less desirable community stages.

It is to be remembered that mowing is possible only upon areas of suitable topography and level, and is impossible upon steep slopes, in broken country, and where stones and termite mounds are abundant.

Firing costs little or nothing, apart from the making of fire-breaks, is rapid, and is everywhere effective unless attempted either too early in autumn or too late in the spring. If the correct season be selected for the particular class of community, a desirable stage in the succession in the grass savanna or in the tree-and-grass savanna may either be maintained or encouraged by firing plus suitable management of the grazing. While firing has been the practice in the fijnbos of the South-Western Cape for several centuries, we still know less about the seasonal features and the more suitable methods of management after firing this class of vegetation, than is the case regarding the grass and the tree-and-grass communities. From my own experience in the fijnbos of the George—Knysna region, I am strongly inclined to the view that experimental work relatively soon would show one season to be more suitable than another, so far as obtaining the best increase in browse or grazing, and the minimum development of poisonous Monocotyledons such as the Moreas, Homerias and Urgineas. Firing of fijnbos in accordance with a seasonal plan, and at intervals of several years, would give the farmer more suitable browse and grazing, and would not impair soil conditions or mar the aesthetic features to the extent for which annual firing is responsible.

Grazing shortly or mowing grass has the effect of causing somewhat earlier shooting than is the case upon ungrazed, or lightly grazed areas adjacent ; firing has an even more pronounced effect. This effect can be turned to utility in such areas where undesirable grasses it is required to reduce or eliminate, shoot markedly before the better grasses. The efficacy of controlled firing, followed by early shooting of undesirable species such as *Elionurus argenteus* (Zuurpol), *Aristida angustata* (Besemgras), *Tristachya Rehmannii* (Blaauwdraadgras), and Eragrostis spp.,

which are grazed off by controlled movement of stock, is being proved upon experimental plots at the Botanical Research Station, Frankenwald. Work in other grass communities probably would show the method to have use therein as well.

It is becoming abundantly clear from observations in various parts of the country, in which there is a marked increase in Acacias such as *A. Karroo* (Zoetdoring), *A. caffra* (Kaffer Wag 'n bietje), *A. robusta* (Brosdoring), *A. permixta* (Fijndoring), *A. litakunensis* (Haak-en-steek), and other large woody shrubs such as Gymnosporia spp., *Zizyphus mucronata* (Blinkblaar) and *Dichrostachys glomerata* (Sikkelbos)—where representatives of these species occur naturally—that withholding of fire, in combination with overstocking, has been responsible for this accelerated increase in woody growth. My interpretation is this : in areas where such woody growths appear, they by nature form the climax vegetation, a Thorn or Mixed Scrub. Ever-recurring fires in the grass communities associated with them, has in time past, prevented their attaining a general dominance. Over-stocking has removed or eased the competition previously existing between scrub and grass for water and solutes, and at the same time has been the cause of elimination or strong reduction in grass fires always somewhat detrimental to the shrubs : hence the accelerated growth and influx of woody growth, serving as an example of what I have termed (Phillips 1934) succession-acceleration. Protection of such poorly grassed, shrub-dense areas against grazing for a season or two, with subsequent controlled firing of the grass that would appear in the glades, would go a long way toward improving their pastoral value. Thinning of the scrub by felling or poisoning—for example by spraying smaller growth with 5 per cent. sodium chlorate—would aid the good work of the controlled fires.

Periodic controlled burning of grass has a further good effect, in that it destroys old growth liable to be infected by micro-organisms suspected to be associated with stock diseases.

Where soils over-rich in organic matter, much of it but very incompletely decomposed, have to be utilised for agricultural or forestry purposes, firing of the vegetation and of the excess organic accumulation certainly improves the conditions for cultivation and growth.

Fortunately the Union has but a relatively small extent of country under tsetsefly (*Glossina pallidipes*, in portion of Zululand). In Central Africa, where vast areas are under influences of one or other species of the genus, protection of grass for several seasons, and ultimate controlled firing of this and patches of dense woody growth utilised for depositing of the larvae and development of the puparia and imagoes, has been responsible for reduction in number of fly ; combined with bush clearing, it has freed areas for human habitation and grazing.

A Suggestion towards the Solution of the National Problem.

While we would agree that the building up of an enlightened public opinion would be the best protection possible against abuse of fire, and indeed should be the aim of scientific workers, agriculturists, foresters and educationalists to attain in time, it is perfectly plain that we cannot await such a time as shall see the average farmer gifted with both knowledge and a sensitive conscience. Vegetation, soil, and water supply are annually being lost. Hence action is urgently necessary.

I consider the rational procedure to be much as described below :—

(1) We must make up our minds that, for present purposes, certain classes of locality demand protection from all kinds of grazing, browsing, and firing, and that certain other classes demand early application of controlled firing ; the remainder of the country we must leave unattended until the more important portions have been dealt with satisfactorily. So far as complete protection from grazing, browsing and firing is concerned, I consider the classes of locality to embrace (i) all important catchment areas feeding water supplies utilised either for human consumption or for irrigation ; in practice, such would be certain mountain tops and slopes, valleys and water-course ravines ; (ii) certain mountain and other areas unquestionably suitable for conservation and improvement of natural forest, and for planting and proper management of suitable exotic trees required for timber or other purposes. Areas urgently calling for attention in terms of controlled grazing, browsing and firing include some of the more important coastal and inland mountain regions, and less important catchment areas generally.

(2) Responsibility for investigating the principal general features of the problems set in the two classes of locality to which is made above, and for arranging for the execution of more detailed studies by men of adequate training, should be vested in a special Commission or Department of the Government. Such a Commission of Conservation should be under the chairmanship of the Minister of Agriculture and Forestry, and should include senior representatives of the following Departments : Agriculture and Forestry, Veterinary Science, Irrigation, Native Affairs, Railways, National Roads Board, Police, Education, Union and Provincial. Such a Commission should have power to co-opt for special purposes representatives of Farmers' Associations. It will require legal advice. Such a Commission should proceed to consider, *inter alia*, the following highly important matters :—

(i) The legal aspects of appropriation of certain localities for complete protection ; the study of appropriation in relation to both existing legislation and that which is requisite to the purpose to be achieved.

(ii) The legal mechanism as well as the practical mechanism for institution of a policy of controlled grazing, browsing and firing within specified classes of area.

(iii) The classification of areas in terms of (i) and (ii) above, based upon the information and guidance of scientific and other suitably trained officers.

(iv) The formulation of a policy for each important area concerned, based upon information of scientific and other suitably trained officers.

(v) Details of the mechanism for enforcement of protection and of control, without which the whole scheme would fail—a law being only as strong as the force behind it. Matters of staff, patrolling, reporting, provision of notices, and provision of adequate fire-breaks would require careful consideration, organisation and financial support. Co-ordination of functions of the several Departments concerned would be essential to smooth working and success; details would vary with each portion of the country, the Department best suited to assume local responsibility, and the like.

(vi) The most suitable methods of imparting education regarding the objects of the Commission, and the national importance of successful achievement of such.

It must be emphasised that under present circumstances uncontrolled firing is costing this country untold millions, and is creating for posterity a most serious state of affairs, which no amount of money ever would be capable of putting right. Expenditure, even of relatively large sums, is therefore amply justified.

Summary.

(1) The influence of fire in vegetation is discussed on account of the renewed interest shown in the matter, since the adoption by Government of a policy of veld improvement.

(2) An attempt is made to indicate both the harmful and the beneficial influences of fire. Certainly destructive when uncontrolled, fire may be turned to good utility when regulated according to objects of management, season, frequency, and locality.

(3) An outline is given of the procedure considered to be necessary before adequate control of fire could be possible. A special Conservation Commission is suggested, and some of its principal duties are discussed briefly.

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PLANTAE NOVAE AFRICANAE

"Ex Africa semper aliquid novi."—*Pliny.*

SERIES VI.

By
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and
Miss E. E. Esterhuysen, M.A.

Oxalis blastorhiza, Salter (Oxalidaceae) § Tripartitae (Lineares).

Planta parva, gracillima, 3—5 cm. alta, caule exserto. *Bulbi* late subuloidei vel ovoideo-subuloidei, saepe leviter tortuosi, ad 4·5 cm. longi, juniores inter bulborum seniorum tunicas imbricantes papyraceas exorientes. *Rhizomata* plerumque fascicularia, ad 6 cm. longa, squamis parvis amplexicaulibus satis numerosis et radiculis paucis induta. *Caulis* gracilis, rigidus, ad 4 cm. longus, rare ramosus, atro-viridis, minute pubescens, squamis 1—2 instructus. *Folia* 6—12, ad caulis apicem aggregata, petiolis pubescentibus 0·5—1·5 cm. longis: foliola lineari-oblonga, saepe leviter cuneata, conduplicativo-falcata, emarginata, 5—9 mm. longa, 1·5—3 mm. lata, supra glabra, infra pubescentia, ciliata. *Pedunculi* uniflori, pauci, 5—8 mm. longi, pubescentes, ad apicem bibracteati bracteis parvis subulatis ciliatis, calycem saepe imbricantibus. *Sepala* late lanceolata, 2·5—3mm. longa, pubescentia, crispato-ciliata, inferne purpureo-marginata, ad apicem nigrescentia, callis 2 apicalibus elongatis induta. *Corolla* 1·2—1·5 cm. longa, pallide lilacea, tubo subanguste infundibuliforme luteo: petala spathulata, 2·5—3 mm. lata., venis violaceis notata, marginibus, in unguiculae medio, striis purpurcis, fere 1 mm. longis, ornatis. *Filamenta* (parte connata inclusa) exteriora 2—3·5 mm., glabra, interiora 3—6 mm. longa, glandulosa, edentata. *Ovarium* ovoideum, fere 1 mm. longum, in dimidio superiore pubescens, ecallosum, stylis ad basin pubescentibus, superne pluricellulari-pilosis. *Capsula* globosa, loculis 2-ovulatis.

Hab. Cape Province: 4 miles north of Van Rhyn's Dorp, *Salter* 5607 (*type* in Bolus Herbarium.)

An affinity of *O. tenella*, Jacq., but a more slender plant, differing in having much narrower pale lilac petals, rather coarser pubescence on the leaflets and in the shape and method of vegetative reproduction of

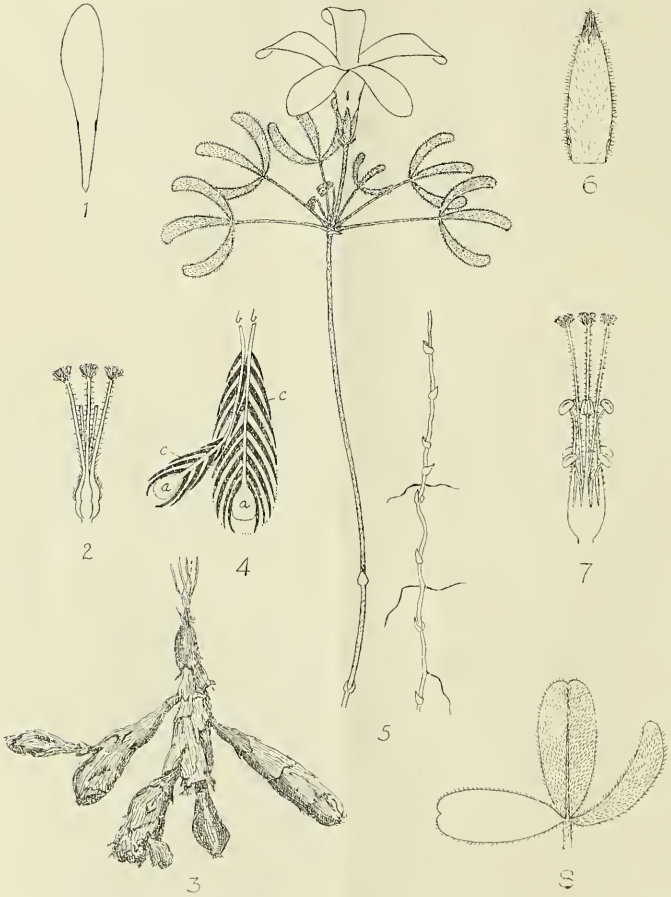

Fig. 1. *Oxalis blastorhiza* Salter. 1. Petal × 2. 2. Gynaecium × 6. 3. Bulbs, natural size. 4. Diagram showing course of rhizomes through bulb tunics: a.a. living nuclei, b.b. rhizomes, c.c. bulb tunics (not to scale). 5. Plant × 2. 6. Sepal × 9. 7. Androecium × 6. 8. Leaf, showing upper and under sides of leaflets 4. (*Salter* 5607.) *Del.* T. M. Salter.

the bulbs. The bulb structure, which sometimes superficially resembles a branched tuber, seems to be peculiar to this species.

The bulbillae are apparently developed on the lowest part of the rhizome within the imbricating tunics of the parent bulb, sending up their own rhizomes through these tunics to emerge at the common apex.

Oxalis bullulata, Salter (Oxalidaceae) § Tripartitae (Rotundatae).

Planta parva, fere glabra, 2—5 cm. alta (rare altior) caule non exserto. *Bulbus* ovalis vel subglobosus, apice basique acutus, leviter angularis, ad 1·4 cm. longus, tunicis rugosis bullatis brunneis. *Rhizoma* 1—3 cm.

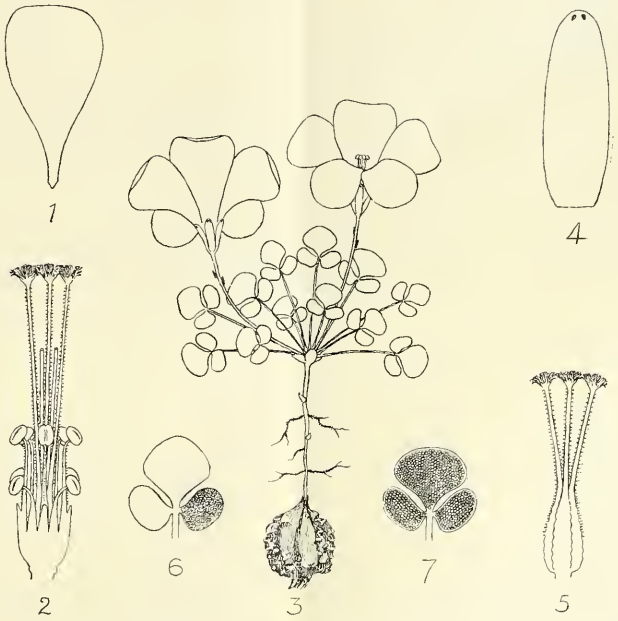

Fig. 2. *Oxalis bullulata* Salter. 1. Petal × 1½. 2. Androecium × 6. 3. Plant and bulb, natural size. 4. Sepal × 6. 5. Gynaecium × 6. 6. A leaf, under side × 2. 7. A leaf, upper side × 2. (*Salter* 5552.) *Del.* T. M. Salter.

longum, squamis paucis parvis instructum. *Folia* basalia, 10—18 : petioli 0·5—2 cm. longi, ad basin (infra articulum) leviter dilati, interdum, sicut pedunculi, sparse minuteque glanduloso-pilosi : foliola sessilia,

medium suborbiculare, antice rotundatum, ad basin late cuneato-attenuatum. interdum securiforme, 2—7 mm. longum et latum, lateralia oblique rotundata, minora, in vita nitescentia cellulis conspicuis, in sicco utrinque manifeste celluloso-lacunosa, glabra. *Pedunculi* 1—3 cm. longi, folia superantes, in dimidio superiore bibracteati bracteis minutis linearibus alternantibus. *Sepala* 4—6·5 mm. longa, oblonga vel lanceolato-oblonga, obtusa, submembranacea, glabra, callis 2—4 apicalibus instructa. *Corolla* 1·5—2·1 cm. longa, lutea, tubo breve late infundibuliforme concolore : petala e basi breviter unguiculata ($\frac{1}{3}$ laminae) cuneato-obovata, subtruncata 0·8—1·2 cm. lata. *Filamenta* (parte connata inclusa) exteriora 2·2—4·5 mm., glabra, interiora 3·5—7 mm. longa, glanduloso-pilosa, in forma medio-stylosa edentata, in ceteris breviter dentata, longissima e corollae tubo exserta. *Ovarium* ovoideo-oblongum, in dimidio superiore glandulosum, ecallosum, stylis glandulosis. *Capsula* fere 4 mm. longa, loculis multi-ovulatis.

Hab. Cape Province : Namaqualand ; 10 miles north-west of Steinkopf, flowers June-July, *Salter* 5552 (*type* in Bolus Herbarium) : Van Rhyn's Dorp Div. ; 11 miles south of Nieuwerust, *Salter* 2513, 3387, Vlermuisklip, 968 : S.W. Africa ; Buchuberge, *Dinter* 6372 (*O. parvicormus*, M.S.).

This species may be recognized by its bulb, the outer tunics being wrinkled and puckered. It is perhaps nearest to *O. inaequalis*, Weintroub, but besides the difference in the bulb, the corolla tube is wider, the claws of the petals much shorter in proportion to the lamina and the styles are also shorter. It is also near *O. bella*, R. Kunth, which has, however, a narrow elongate bulb, obcordate leaflets and a white corolla.

The plants vary considerably in size, those from the Van Rhyn's Dorp District being smaller, with leaflets rarely exceeding 3 mm. in length and there has been no tendency to enlargement in cultivation. The difference is scarcely sufficient to warrant any varietal distinction (v.v.s., v.v.c.)

Dinter 6372 which I attribute to this species was distributed and has been referred to under the *manuscript* name *O. parvicormus*, but as the mature bulbs are by no means the smallest among the South African Oxalis, I have considered it best to discard this name as unsuitable.

Oxalis lichenoides, Salter (Oxalidaceae) § Tripartitae (Rotundatae).

Planta minima glauca, omnino glabra, caule non exserto, ad 3·5 cm. alta. *Bulbus* ovoideus vel oblongus, ad 1·4 cm. longus, 5—6 mm. latus, manifeste alatus : tunicae ellipticae, longitudinaliter concavae, subnitentes, brunneae, marginibus undulate crenulateque aliformibus.

Rhizoma breve, gracile, inferne annorum praeteritorum tunicis vel bulbis, interdum in serie moniliforme obtectum, superne breviter glanduloso-pilosum, squamis minutis instructum. *Folia* basalia, numerosa : petioli graciles, ad 2 cm. longi, sicut pedunculi subpellucidi, ad basin

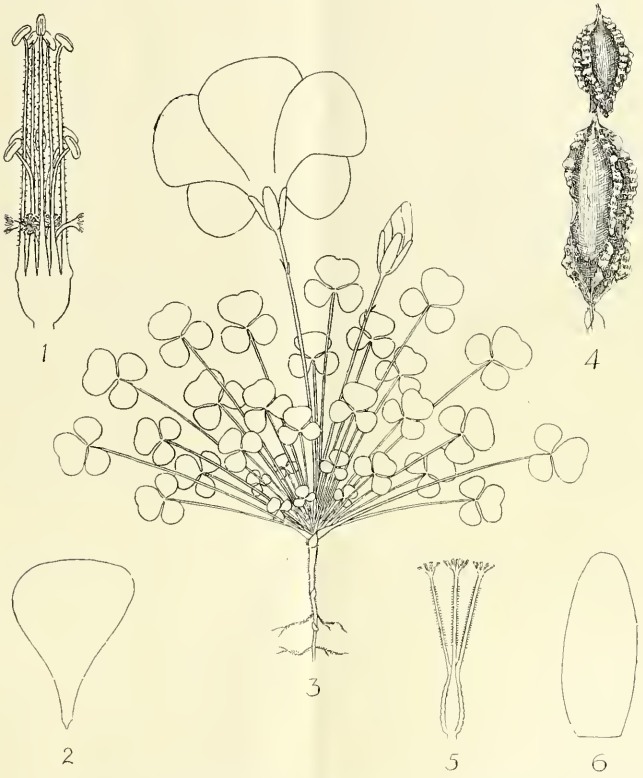

Fig. 3. *Oxalis lichenoides* Salter. 1. Androecium × 6. 2. Petal × 2. 3. Plant × 2. 4. Bulb × 2. 5. Gynaecium × 6. 6. Sepal × 8. (*Salter* 928.) *Del.* T. M. Salter.

articulati (in vita, sapa coccinea leviter tincti) : foliola 3 (in sicco utrinque conspicue impresso-punctata), medium late rotundatum, nunc ad basin attenuatum, nunc leviter marginatum vel retusum, ad 2·5 mm. longum, 3·5 mm. latum, lateralia oblique suborbicularia, minora, integra. *Pedunculi* uniflori, ad 3·5 cm. longi, folia superantes, prope

apicem bibracteati bracteis alternantibus, subulatis, membranaceis, fere 1·5 mm. longis. *Sepala* elliptico-oblonga vel ovato-oblonga, obtusa, submembranacea, 3—4 mm. longa. *Corolla* 1·2—1·4 cm. longa, alba (in sicco interdum lutescens), tubo breve late infundibuliforme luteo: petala latissime cuneata ad basin leviter attenuata, antice subtruncata, 6—9 mm. lata. *Filamenta*, exteriora glabra, interiora glandulosa, levissime gibbosa vel edentata, longissima (parte connata inclusa) 7—7·5 mm. longa, e corollae tubo satis exserta (forma longistylosa non visa). *Ovarium* oblongum, 1·5 mm. longum, glabrum vel sparsissime glandulosum, loculis multi-ovulatis, stylis ad basin glabris, superne glandulosis.

Hab. Cape Province: Van Rhyn's Dorp Div.; one mile south of Bitterfontein, flowers June, *Salter* 928 (*type* in Bolus Herbarium), Knecht's Vlaagte, 10 miles north of Zout River Bridge, 5460 (one plant).

A close affinity of *O. bella*, R. Knuth, differing in its lichen-grey foliage, proportionately shorter peduncles and very distinct undulate-winged bulbs. Its habit is also different for it is always found growing in the shade of small shrubby plants (especially mesembrianthemum) where it is very difficult to detect unless in flower. The broad crenulate wavy margins of the *concave* bulb-tunics are adpressed to one another, forming somewhat irregular wings to the bulbs and the old bulbs often persist on the rhizome, sometimes in a moniliform series one above the other. The petioles and peduncles exude a pale vermilion sap under pressure, a character never noticed in *O. bella*. The floral characters in Fig. 3 were drawn from *Salter* 5460.

Oxalis Fourcadei, Salter (Oxalidaceae) § Tripartitae (Oblongae).

Planta hirsuta, 4—6 cm. alta, caule non exserto vel breviter exserto. *Bulbus* ovalis, basi apiceque attenuatus, ad 2 cm. longus, tunicis exterioribus attenuato-acutis rigidis fuscis, interioribus brunneis. *Rhizoma* 0·5—2·5 cm. longum, in parte superiore hirsutum, squamis paucis amplexicaulibus indutum. *Caulis* nil vel ad 0·5 cm. longus, squamis 2—3 anguste ovatis amplexicaulibus cuspidatis, ad 0·9 cm. longis, hirsutis, ciliatis, instructus. *Folia* 2—8, basalia, adscendentia, petiolis 1—2 cm. longis, dense hirsutis: foliola 3, sessilia, linearia vel anguste oblonga, 1—2·5 cm. longa, 2—4 mm. lata, obtusa, lateralia in margine exteriore basale leviter obliqua, manifeste involuta, ciliata, punctis parvis numerosis aurantiacis (in sicco atris) marginaliter notata, utrinque hirsuta, supra laevigata, infra in nervo mediale conspicuo dense hirsuta, leviter impresso-punctata, saepe purpurea. *Pedunculi* ad 6, uniflori, 1·5—3·5 cm. longi, hirsuti, ad basin, infra articulum, teretes, ad apicem bibracteati bracteis linearibus alternantibus hirsutis rubellis vel rarius ebracteati. *Sepala* late lanceolata, 6—8 mm. longa, hirsuta, praecipue

in dimidio superiore purpureo-marginata, ecallosa. *Corolla* 1·7—2·0 cm. longa, alba, tubo luteo: petala e basi unguiculata leviter attenuata, superne obovata, fere 7 mm. lata, ad apicem acutiusculum callis paucis aurantiacis ornata. *Filamenta* pilosa vel fere glabra (parte connata inclusa), exteriora 2 mm., interiora 3—4·5 mm. longa, breviter dentata (forma brevistylosa non visa). *Ovarium* ovoideo-oblongum, fere 2 mm. longum, in dimidio superiore pilosum, ad apicem callis 10 oblongis ornatum, loculis 8—9-ovulatis, stylis plus minusve pilosis.

Hab. Cape Province: Uniondale Div.; Kamanassi Hills, 8 miles west of Avontuur, 3,100 ft., Oct., 1933. *H. G. Fourcade* 5063 (*type* in Kew Herbarium).

An affinity of *O. algoensis*, E. and Z. (E. and Z. 704!), but differing in the shape of the leaflets which are linear or narrow-oblong, the medial obtuse at the base and not tapering cuneately and the lateral are less unequal sided. In the dried state the leaflets are smooth and show no signs of collapsed cells on the upper surface and only very slight signs on the lower, while in *O. algoensis** this character is very marked on both surfaces of the leaflets. The teeth on the inner filaments are much shorter and more obtuse. The density of the indument on the filaments, ovary and styles is variable in this species.

Oxalis anomala, Salter (Oxalidaceae) § Cernuae (Purpuratae).

Planta gracilis ad 18 cm. alta, caule non exserto. *Bulbus* globosus vel ovoideus, apice attenuatus vel rostratus, 1·5—2·7 cm. longus, tunicis exterioribus subligneis, longitudinaliter nervatis, plerumque minute bullatis, atro-brunneis. *Rhizoma* tenue, squamis late ovatis semiamplexicaulibus membranaceis indutum. *Folia* 10—30, basalia: petioli 2—6 cm. longi, graciles, sparse villosi, ad basin (infra articulum) squamiformes, villosi: foliola breviter petiolulata, latissime obcordata, ad basin cuneato-attenuata, antice ad $\frac{1}{4}$-incisa, 3—7 mm. longa, 0·5—1·1 cm. lata, supra glabra, infra villosa (in vita) livido-purpurascentia. *Pedunculi* basales, *uniflori vel biflori*, folia valde superantes, sparsissime villosi, ad 11 cm. longi: bracteae 2—4, subulatae, 3—4 mm. longae, villosae, apice minute callosae: pedicelli 1 vel 2, 3—4·5 cm. longi, glabri. *Sepala* lanceolata vel late lanceolata, 5—7 mm. longa, glabra vel sparsissime villosa, callis

*The medial leaflets in *O. algoensis* are variable in shape, elliptic-oblong, sometimes 4 times as long as broad, or shorter and somewhat rhomboid, but always tapering more or less cuneately to the base. There are many intermediates between this species and *O. collina*, E. and Z., which differs only in the shape of the leaflets, the medial being often broader than long and the undulate (not crenate) margin is not a constant character. I, therefore, believe the two to be conspecific. In both cases Sonder describes the under surface of the leaflets as tomentose, but he seems to have been deceived by the scurfy appearance of the collapsed cells beneath the hairs which gives them at first glance a matted appearance.

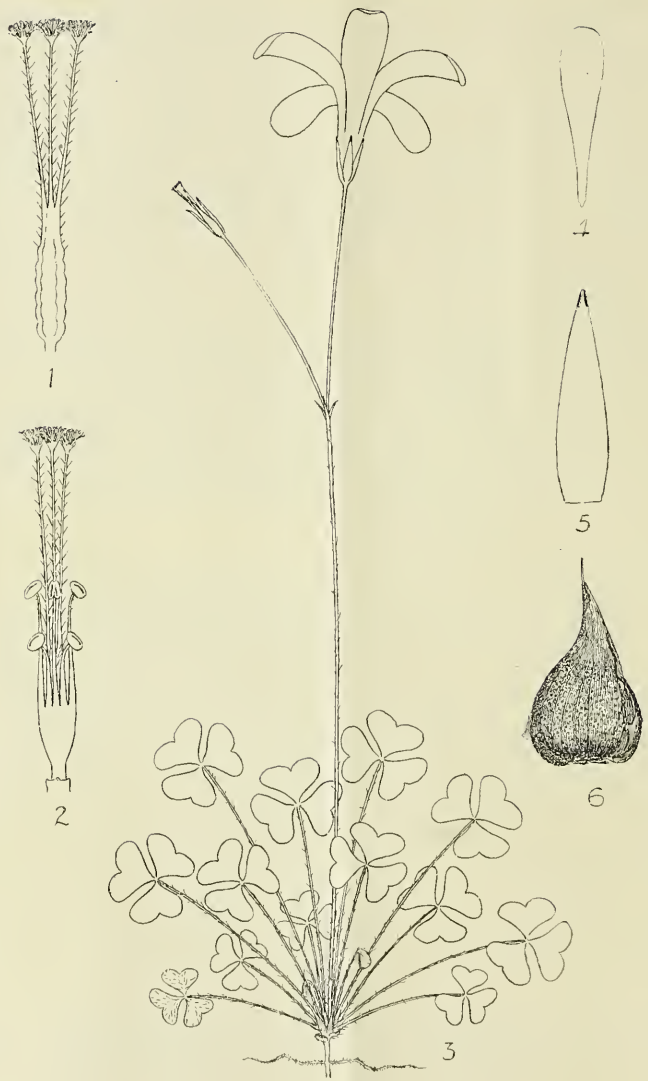

Fig. 4. *Oxalis anomala* Salter. 1. Gynaecium × 6. 2. Androecium × 6. 3. Plant, natural size. 4. Petal, natural size. 5. Sepal × 5. 6. Bulb, natural size (*Salter* 2334.) *Del.* T. M. Salter.

2 elongatis aurantiacis apice instructa. *Corolla* 2·1—2·8 cm. longa, roseo-violacea, tubo angusto viridi-luteo cum laminis aequante: petala cuneato-spathulata, 6—7 mm. lata, leviter venata. *Filamenta* (parte connata inclusa) exteriora 3—5 mm., glabra, interiora 5—8·5 mm. longa, apice sparsissime glandulosa, edentata, longissima inaequalia. *Ovarium* oblongum, 2—3 mm. longum, breviter stipitatum, ad apicem, sicut styli, villoso-pubescens, loculis 6-ovulatis.

Hab. Cape Province: Swellendam Div.; near Warmbad, Barrydale, flowers June-July, *Salter* 2334 (*type* in Bolus Herbarium), *L. Bolus*, Bolus Herbarium 20110: Ladismith Div.; 10 miles south-west of Ladismith, *Salter* 2332.

An affinity of *O. caprina*, L., but differs in having less deeply divided leaflets, peduncles with one or at most two flowers, a much larger corolla with narrower petals and a very different bulb. (v.v.s., v.v.c.)

Oxalis campylorhiza, Salter (Oxalidaceae) § Tripartitae (Obcordatae). *Planta* viscosa, caule exserto vel rare non exserto, sparse ramoso, ad 15 cm. alta. *Partes herbaceae* pilis capitatis, saepe pluricellularibus dense pilosae. *Bulbus* globosus vel depresso-globosus, basi praemorsa, apice conico oblique etiam horizontaliter deflexo, ad 2 cm. altus, 3 cm. latus: tunicae imbricantes, sub-rigidae, ad basin diffisae, apice attenuato-aciculares, brunneae. *Rhizoma* 5—10 cm. longum, squamis paucis amplexicaulibus instructum. *Caulis* erectus, interdum bifurcatus, 2—12 cm. longus, nonnumquam e squamae vel foliorum caulinorum axillis breviter ramulosus. *Folia* satis numerosa, ad caulis vel ramulorum apices aggregata, rare 1—2 caulina, petiolis ad 2·5 cm. longis: foliola obcordata, inferne interdum subcuneata, medium breviter petiolulatum, lateralia sessilia, tenuia, nervata, 0·5—1 cm. longa, 5—9 mm. lata, supra glabra, infra et marginibus pilis pluricellularibus capitatis pilosa. *Pedunculi* 1—6, uniflori, terminales, 2—7 cm. longi, bracteati bracteis 1—2 (rare 0) minutis gracillimis 1—1·5 mm. longis. *Sepala* ovato-lanceolata, attenuata, valde acuta, subpellucida, 3—6 mm. longa, rare apice rubro-callosa, plerumque minute purpureo-maculata, ciliata. *Corolla* 1·3—2·2 cm. longa, alba vel rare rosea, tubo breve luteo: petala oblique cuneato-obovata ad basin breviter leviterque attenuata, antice oblique subtruncata, 6—10 mm. lata, unguiculae basi extrema purpurea, ad marginem exteriorem glanduloso-ciliata et saepe purpureo-maculata. *Filamenta* (parte connata inclusa) exteriora 2·5—4 mm., glabra, interiora 4—7 mm. longa, ad apicem glabra, inferne minute glanduloso-pilosa, breviter obtuseque dentata. *Ovarium* ovoideo-oblongum, 1·5—2·2 mm. longum, in dimidio superiore, sicut styli, glandulosum vel pluricellulari-pilosum, ecallosum. *Capsula* subglobosa, loculis 2—3-ovulatis.

Hab. Namaqualand; 9 miles north-west of Steinkopf, flowers May-July, *Salter* 5553 (*type* in Bolus Herbarium); near Steinkopf, 5557 (pink), 5558; Springbok 897; about Kamieskroon 800, 860, 4601, 4606.

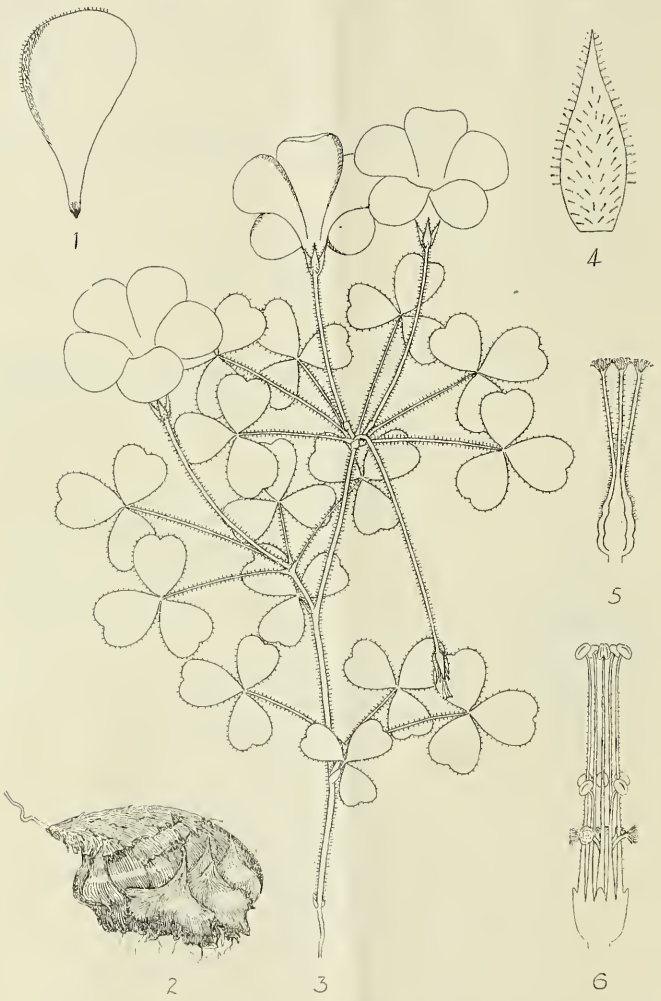

Fig. 5. *Oxalis campylorhiza* Salter. 1. Petal × 1½. 2. Bulb, natural size. 3. Plant, natural size. 4. Sepal × 6. 5. Gynaecium × 6. 6. Androecium × 6. (*Salter* 5553.) *Del.* T. M. Salter.

A very variable species allied to *O. amblyosepala*, Schltr., but more upright in habit. It differs in having sharply acute sepals and leaflets rather broader in proportion to their length. It is also probably an affinity of *O. ebracteata*, Savign., but differs in having apical peduncles and leaves, the latter with much longer petioles. The mature bulb, which is unlike any other that I have seen in this genus, is broader than it is long. The base is usually flattened and praemorse and the conical or attenuate apex is generally bent over nearly at right angles to the axis. The young bulbs are ovoid with the apex more or less upright. (v.v.s., v.v.c.)

(Note.—Several specimens of this plant have been distributed under the name *O. variiformis* M.S.)

Oxalis kamiesbergensis, Salter (Oxalidaceae) § Tripartitae.

Herba parva, fere 2 cm. alta, caule non exserto. *Bulbus* ovoideus, attenuatus, 1·5—2·5 cm. longus, tunicis papyraceis rugosis brunneis, apice acutis. *Rhizoma* ad 10 cm. longum, pallidum, squamis ovatis amplexicaulibus, ad 4·5 mm. longis indutum. *Folia* 10—30, basalia: petioli fere 1 cm. longi, breviter pilosi, ad basin (infra articulum) dilati: foliola 3, sessilia, lineari-oblonga vel cuneato-oblonga, conduplicativo-falcata, minute emarginata, 6—9 mm. longa, 2—3 mm. lata, supra glabra, infra pubescentia, nervo mediale conspicuo, ciliata, callis minutis inconspicuis atro-brunneis dense notata. *Flores* viventes 1—3. *Pedunculi* uniflori, satis numerosi, post anthesin deflexi, fere 0·5 mm. longi, rare longiores, pilosi, paulo infra calycem bibracteati bracteis subulatis ciliatis, fere 1·5 mm. longis. *Sepala* ovato-lanceolata vel lanceolata, saepe acuminata, 4—5 mm. longa, pubescentia, ciliata, apice inconspicue bicallosa. *Corolla* glabra, 1·7—2·2 mm. longa, rosea, ad fauces albescens, tubo infundibuliforme luteo: petala cuneata vel oblique cuneata, in parte inferiore leviter attenuata, antice rotundata obscure acutiuscula. *Filamenta* (parte connata inclusa) exteriora 3—7 mm. longa, glabra vel in forma longistylosa sparse glandulosa, interiora 5·5—11 mm. longa, inaequalia, minute glandulosa, edentata, longissima e corollae tubo exserta. *Ovarium* ovato-oblongum, fere 1·3 mm. longum, inter angulos callis rubris notatum, in dimidio superiore pilosum, stylis ad basin pilosis, superne glandulosis. *Capsula* globoso-ovoidea, loculis 3-ovulatis.

Hab. Namaqualand: Kamiesberg Mts., 6 miles east of Kamieskroon in open grassy places, *Salter* 5513 (*type* in Bolus Herbarium).

This small plant is an affinity of the following (*O. albiuscula*, Salter, q.v.) but the leaflets are quite different in shape and the petals, rose red at the tip, pale gradually to white in the throat of the corolla above the yellow tube. Both might be placed in either of the two somewhat

artificial sub-sections *Oblongae* or *Lineares*. They do not appear to be closely related to any other species, though in some characters they seem to be nearest to *O. ciliaris*, Jacq. and *O. Mundtii*, Sond., both of which have, however, well developed above-ground stems.

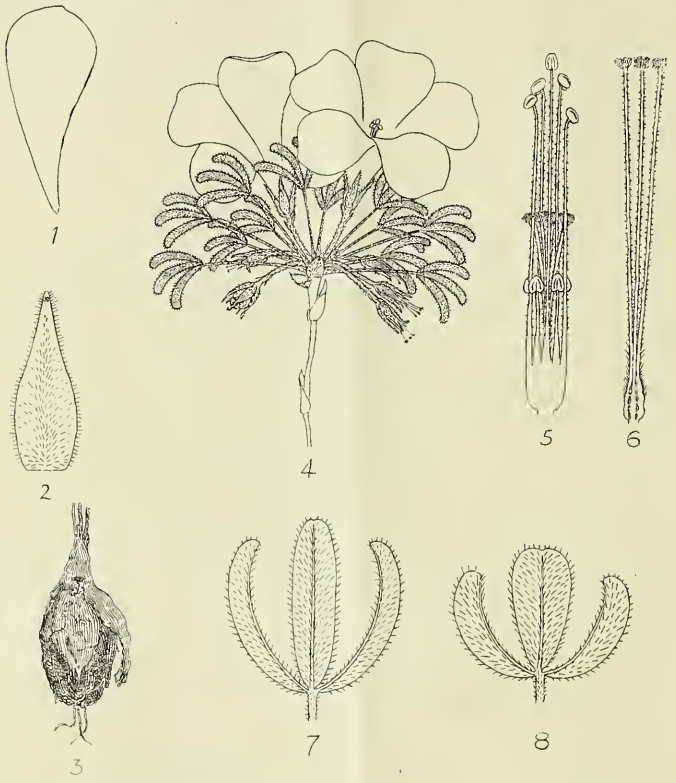

Fig. 6. *Oxalis kamiesbergensis* Salter. 1. Petal × 1½. 2. Sepal × 6. 3. Bulb, natural size. 4. Plant × 1½. 5. Androecium × 6. 6. Gynaecium × 6. 7 and 8. Leaflets, under side × 3. (*Salter* 5513.) *Del.* T. M. Salter.

Oxalis albiuscula, Salter (Oxalidaceae) § Tripartitae.

Herba parva, ad 3 cm. alta, caule non exserto. *Bulbi* saepe congesti, globoso-ovoidei, acuti, ad 2 cm. longi, tunicis papyraceis rugosis fuscis. *Rhizoma* gracile, 3—10 cm. longum, squamis paucis parvis semi-amplexicaulibus instructum. *Folia* basalia, numerosa: petioli 1—2 cm. longi,

graciles, adpresso-pubescentes : foliola 2, sessilia, lineari-oblonga, basi apiceque acuta, mucronulata, 8—12 mm. longa, 1·5—2·5 mm. lata, subconduplicativa vel saepe involuta, supra glabra, infra adpresso-pubes-

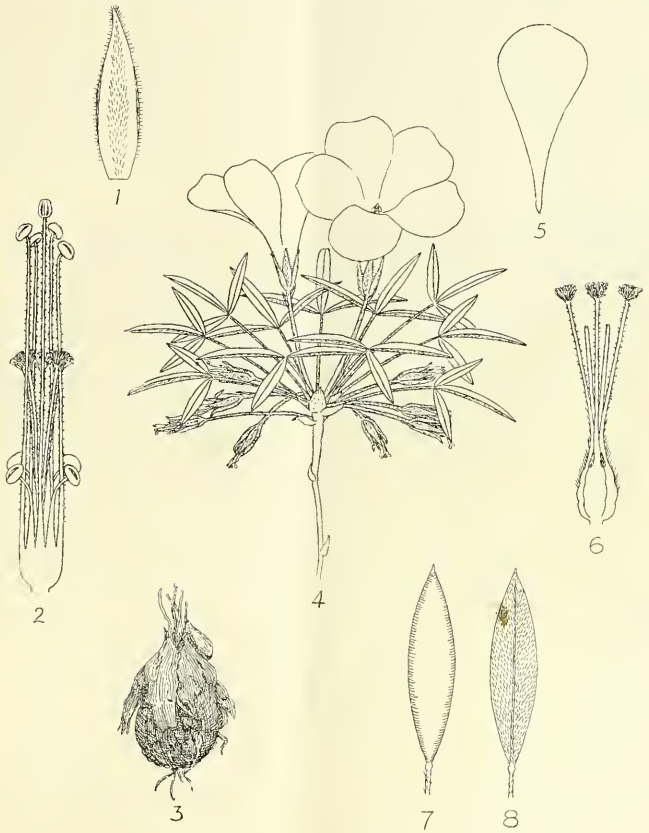

Fig. 7. *Oxalis albiuscula* Salter. 1. Sepal × 6. 2. Androecium × 6. 3. Bulb, natural size. 4. Plant × 1½. 5. Petal × 1½. 6. Gynaecium × 6. 7. Medial leaflet, upper side × 3. 8. Leaflet, under side × 3. (*Salter* 4608.) *Del.* T. M. Salter.

centia, pilis incurvatis dense ciliata. *Flores* viventes 1—2, rare 3. *Pedunculi* uniflori, numerosi ad 35, post anthesin deflexi, folia plus minusve aequantes, sparse pubescentes, ad apicem bibracteati bracteis subulatis

1—1·5 mm. longis, ciliatis, saepe calycem imbricantibus. *Sepala* late lanceolata, interdum breviter attenuata, 4—5 mm. longa, rubescentia, ad medium pubescentia, ad margines glabra, ciliata, ecallosa. *Corolla* glabra, 1·6—2·3 cm. longa, alba, tubo infundibuliforme luteo: petala e basi leviter attenuata cuneato-obovata, antice obscure acutiuscula 0·7—1·0 cm. lata, rare roseo-marginata. *Filamenta* sparse glandulosa (parte connata inclusa) exteriora 3·5—6 mm., interiora 6—10 mm. longa, valde inaequalia, edentata. *Ovarium* ovoideum, 1·6 mm. longum, in dimidio superiore cano-pubescens, ad apicem callis elongatis ornatum, stylis ad basin pilosis, superne glandulosis. *Capsula* subglobosa, loculis 2—3-ovulatis.

Hab. Namaqualand: 6 miles south of Kamieskroon, plentiful but very local, June 1934, *Salter* 4608 (*type* in Bolus Herbarium) and 5509; 13 miles south of Kamieskroon, *Salter* 5572.

This species is closely related to the foregoing (*O. kamiesbergensis*, Salter, q.v.) but differs mainly in the shape of the leaflets, which taper to a point at both ends and are slightly mucronate, an uncommon character in this genus. It also has a softer and shorter indumentum, white flowers, fewer calli on the ovary and ecallose sepals. As evidenced by the large number of dead flowers and capsules it has a long flowering season and flowers prolifically, although the plants had only 1, 2 or 3 flowers actually in bloom.

No. 4606 was found growing in arable land and the bulbs were all lying in the ground horizontally or slightly inverted, a peculiarity at first thought to be characteristic of the species. Later collecting in undisturbed ground shows, however, that the bulbs lie upright in congested masses formed by the yearly increase of the new bulbillae and it is probable that those first examined had been scattered and turned over by ploughing. The bulb illustrated is from No. 5509. (v.v.s.. v.v.c.)

Erica Comptonii, Salter (Ericaceae-Ericoideae) § Didymanthera.

Frutex erectus rigidus, ad 60 cm. altus. *Rami* adscendentes, inferne nudi, conspicue cicatricosi, superne dense foliati, cano-tomentulosi. *Folia* 3-nata, erecto-patentia, linearia subtrigona, sulcata (petiolo incluso), 1·3—1·6 cm. longa, supra et ad margines prope basin minute tomentulosa, demum omnino glabra, superne serratulata, apice seta pallida, 1—1·5 mm. longa, denique caduca, aciculata, petiolis fere 2 mm. longis, albo-ciliatis. *Flores* 3-nati, subcernui, ramos ramulosque terminantes. *Pedunculi* 1·5—2 mm. longi, cano-tomentosi: bracteae 3, linearilanceolatae, calycem adpresse imbricantes, 0·9—1·2 cm. longae, alioque sepala similes. *Sepala* lanceolata, convexa, rigida, carinata, 0·9—1·1 cm.

longa, praeeipue in parte inferiore minute ciliata, alba, ad apicem viridescentia, apice seta pallida 1—1·5 mm. longa instructa. *Corolla* tubiformis, leviter inflata, ore vix constricto, 1·6 cm. longa, glabra, laeticolor, segmentis deltoideis, fere 1·6 mm. longis, viridibus, in floribus maturis abrupte reflexis. *Stamina* valde exserta: filamenta recta, compressa, alba, fere 2 cm. longa, 1 mm. lata: antherae prope basin dorsifixae, basi oblique acutae. lobis oblongo-oblanceolatis, 3·5 mm. longis, demum divaricatis, poro $\frac{1}{3}$ lobi. *Ovarium* subglobosum, sessile, dense eano-serieeum: stigma parvum, turbinatum.

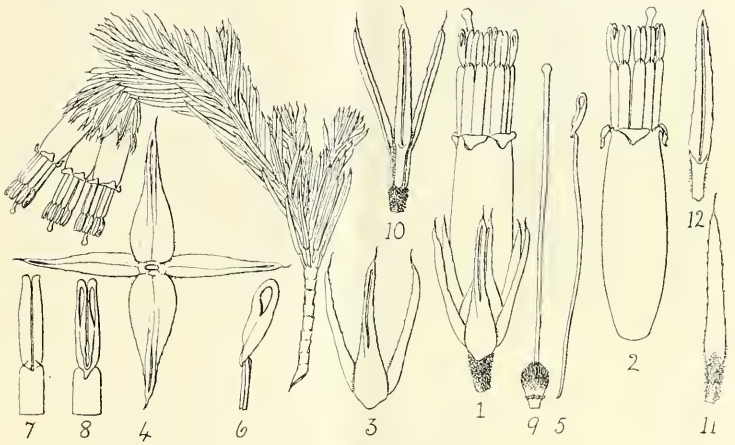

Fig. 8. *Erica Comptonii* Salter. 1. Flower × 2. 2. Corolla × 2. 3. Bracts × 2. 4. Sepals, spread out × 2. 5. Stamen, side view × 2. 6. Anther, side view × 2. 7. Anther, back view × 4. 8. Anther, front view × 4. 9. Gynaecium × 2. 10. Whorl of young leaves × 2. 11. Young leaf, front view × 2. 12. Old leaf, back view × 2. (*Compton* 6066.) *Del.* W. F. Barker.

Hab. Cape Province: Caledon Div.: among rocks, north-east slope of Hangklip, 1,400 ft., flowers Jan., *Compton* 6066 (*type* in Bolus Herbarium), *Pillans* 8183.

This speeies is an affinity of *E. Banksia*, Andr., but can easily be distinguished by its short deltoid leaf-green corolla segments, whieh, in the fully opened flower, are reflexed downwards against the upper end of the tube. It also differs in having much longer and proportionately narrower leaves and braets, which, like the lanceolate sepals, are conspieuously bristle tipped.

Fig. 9. *Erica cygnea* Salter. 1. Flower × 6. 2. Corolla × 6. 3, 4, and 5. Bracts × 6. 7. Stamen × 6. 8, Anther, side view × 12. 9. Anther, back view × 12. 10. Gynaecium × 6. 11. Whorl of young leaves × 6. 12. Old leaf, front view × 6. 13. Old leaf, side view × 6. (*Pillans* 8184.) *Del.* W. F. Barker.

Erica cygnea, Salter (Ericaceae-Ericoideae) § Euryloma.

Frutex erectus densus, ad 30 cm. altus, caule conspicue cicatricoso. *Rami* glabri, foliati, aliquoties alterne recurvi et adscendentes, itaque cygneo-flexuosi. *Folia* 4-nata, erecto-patentia, recurva, dense imbricata, lincaria, subtrigona, sulcata (petiolo incluso) 3—5 mm. longa, pilis longis hyalinis caducis, praecipue ad apicem, ciliata, apice seta brunnea, fere 3 mm. longa, aristata, petiolis 1 mm. longis, glanduloso-ciliatis. *Inflorescentiae* 5—11-umbellatae, cernuae, ramorum recurvorum apice positae. *Pedunculi* 4—5 mm. longi, rubescentes, minute glandulosi : bracteae 3, foliaceae, petiolatae, 2·5—3·5 mm. longae, infima ad medium, ceterae in parte superiore positae, sicut sepala ciliatae, aristatae, viscosae. *Sepala* ovato-lanceolata, 2—3 mm. longa, viscida, viridia, minute glanduloso-marginata, apicem versus pilis hyalinis, quam sepala duplo longioribus ciliata, apice seta brunnea, fere 5 mm. longa, aristata. *Corolla* tubulari-campanulata, ore vix vel levissime constricto, 8 mm. longa, viscosa, rosea, in faucibus rubescens, segmentis acutis suberectis, ad 2·5 mm. longis. *Stamina* inclusa : filamenta ad apices valde latescentia, incurva, crispate albo-ciliata : antherae dorsifixae, subtriangulares, superne leviter attenuatae., basi obliquc bilobulatae, minute scabrae, muticae, 1 mm. longae, poro dimidium lobi aequante. *Ovarium* obovoideum, glabrum, stylo ad apicem subsigmoideo, stigmate capitellato.

Hab. Cape Province : Caledon Div. ; South side of crest of ridge forming the west base of Buffels Mountain, near Rooi Els, flowers Jan., *Pillans* 8184 (*type* in the Bolus Herbarium.)

This species can be recognised by the marked " swan's-neck " flexing of the branches. Although in some respects it does not conform to the existing conception of the section Euryloma. nor, indeed, has it the distinguishing character of the subgenus Stellanthe, viz. : stellato-patent corolla segments, it seems best to include it here owing to its close affinity to *E. Gysbertii*, Guthrie and Bolus. It has, however, a cernuous inflorescence, a shorter and more open-throated corolla, smaller sepals, ciliate filaments, very differently shaped anthers and a broader sessile ovary. It also resembles *E. lananthera*, L. Bolus, but differs in the leaves and stamens. (v.v.s.)

Erica viscidiflora, Esterhuysen (Ericaceae-Ericoideae) § Eurystoma.

Frutex robustus, erectus, glaber, rigidus, ad 50 cm. altus. *Caulis* ad 4 mm. lata, ramis erectis, virgatis, numerosis. *Folia* 3-nata, erecta, oblongo-lanceolata, obtusa saepe minute mucronata, dorso convexo, minute sulcata, glabra, long. 3·5—4·5 mm. lat. 1—1·5 mm., marginibus minute scaberulis. *Flores* 3—4-nata, ramulos breves terminantes, ad ramorum apices dense cumulati. *Pedunculi* puberuli, viscidi, long. 3 mm.,

bracteis 3, ovato-oblongis, concavis, glanduloso-marginatis, viscidis, albis, long. 2 mm., circa medium positis. *Sepala* appressa, ovata, viscida, alba, ad apicem carinata, long. 2·5—3 mm., glanduloso-marginatis. *Corolla* viscida, alba, tubo cyathiforme long. ad 3 cm., lobis valde recurvatis, deltoideis, long. ad 1·75 cm. *Filamenta* flexuosa, long. ad 1·75 cm. *Antherae* exsertae, basifixae, oblongae, basi oblique attenuatae, long. ad 1·75 mm., poro dimidium lobi aequante, cristis attenuatis. *Ovarium* depresso-globosum, hispidulum, stylo exserto, stigmate capitellato.

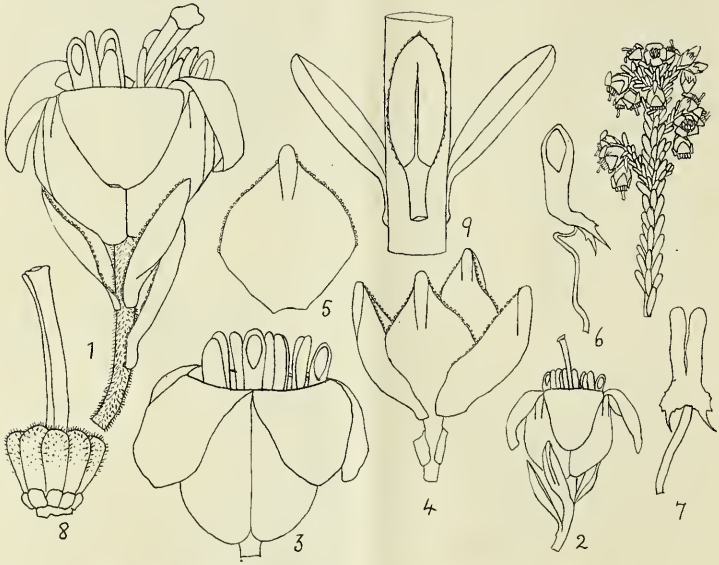

Fig. 10. *Erica viscidiflora* Esterhuysen. (Natural size.) 1. Flower × 9. 2. Do. × 4. 3. Corolla × 9. 4. Calyx × 8. 5. Sepal × 8. 6. Stamen, side view × 9. 7. Stamen, back view × 9. 8. Gynaecium × 9. 9. Whorl of leaves × 8. (*Esterhuysen* 22.) *Del.* E. E. Esterhuysen.

Hab. Cape Province: Paarl Div., Gt. Drakenstein Mts., Drakenstein Peak, alt. c. 4,500 ft., *E. Esterhuysen* 22, October, 1935. (*Type* in Bolus Herbarium.) Summit of Drakenstein Mt., alt. 4,000 ft., *T. P. Stokoe*, Oct., 1922, Bolus Herb. No 17296.

This species is allied to *E. calycina*, Linn., from which it differs in the marked viscidity of the flowers. Its affinities place it naturally in § Eurystoma in spite of the viscidity.

NOTES ON TWO NEW ALOES AND ONE NEW VARIETY.

(With Plates IV—VI.)

By G. W. Reynolds.

In a previous communication,[1] the writer described three new *Aloes* from the Transvaal. In the present paper, a new *Leptoaloe* from the Zoutpansberg, N. Transvaal, is described, together with a new *Leptoaloe* from Pondoland, and a new variety to *Aloe Broomii* Schonl., from Tarkastad, Cape Province.

Aloe Vossii, Reynolds. Species nova et distincta, in sectione *Leptoaloum*, *A. verecundae* Pole Evans affinis, sed foliis rosulatis, maculis subspinulescentibus differt.

Herba succulenta, acaulis, vel brevissime caulescens. *Folia* 14—20, multifaria, e basi 3 cm. lata sensim acuminata usque ad 50 cm. longa, carnosula, supra concava, viridia, subtus convexa, ubique, praesertim subtus, maculis cartilagineis prominulisque vel subspinulescentibus adspersa ; ad margines linea cartilaginea tenuissima cincta, denticulisque parvis, 2—4 mm. distantibus ciliata. *Inflorescentia* simplex, usque ad 50 cm. longa. *Pedunculus* robustus, circiter 10 mm. diam., basi nudus, superne vacue bracteatus. *Racemus* capitatus, circiter 8 cm. longus, 7 cm. latus. *Pedicelli* 30 cm. longi. *Bracteae* ovato-acutae, 16 mm. longae, 11 mm. latae, carnosulae, marginibus albis. *Perigonium* 28 mm. longum, cylindrico-trigonum, faucem versus levissime acuminatum, basi rotundum et breviter stipitatum. *Segmenta exteriora* libera, sub-obtusa ; interiora libera, leviter carinata, marginibus pallidioribus. *Genitalia* demum 1 mm. exserta. *Ovarium* 6 mm. longum, medio 2·5 mm. diam. *Capsula* 18 mm. longa, 8—9 mm. diam., viridia.

Hab : N. Transvaal, Zoutpansberg, 5 miles north of Louis Trichardt on right-hand side of the road, Dr. F. van der Merwe, without number, March, 1935 ; cultivated plant, from "Schyffontein," 5 miles north of Louis Trichardt, fl. 12th February, 1936, in Johannesburg, Reynolds 557 ! (type) in National Herbarium, Pretoria. (Plants 489/34 in National Botanic Gardens, Kirstenbosch.) (Plate IV.)

This distinctive *Leptoaloe* was collected in 1927 by Mr. Harold Voss, (after whom it is named), on slopes of the Zoutpansberg, about 5 miles

[1] *Vide* Journ. of S.A. Bot., Vol. 2, p. 25, Jan., 1936.

Fig. 1.

Fig. 2.

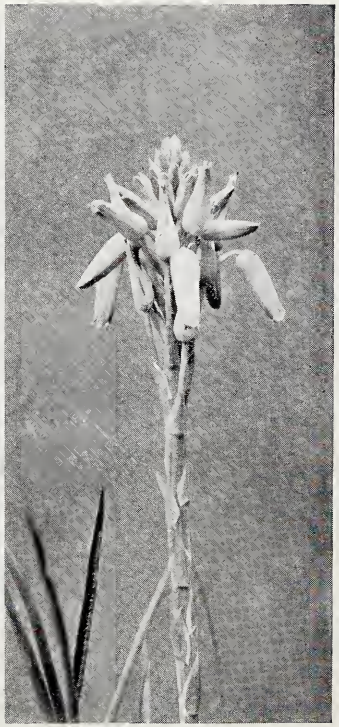

Fig. 3.

Plate IV. *Aloe Vossii*, Reynolds.

Fig. 1. Plant collected by Mr. Harold Voss, 5 miles north of Louis Trichardt, Zoutpansberg, North Transvaal, flowering 12 Feb., 1936, in Johannesburg.

Fig. 2. Flowers 1/1, from the bud to the post-pollination stage.

Fig. 3. Raceme, with upper portion of the peduncle.

north of Louis Trichardt, North Transvaal, at an elevation of about 3,800 ft. It has been collected a few miles further east by Dr. E. E. Galpin and Mr. L. R. Vogts on the farm "Franshoek," and also by Dr. F. Z. van der Merwe in that neighbourhood; it appears to be restricted in its distribution to the Zoutpansberg, and usually flowers in February—March.

Its nearest ally seems to be *A. verecunda* Pole Evans, which it resembles in racemes and flowers,[2] but is immediately separated by its very different rosette, leaves and spots. *A. Vossii* is a larger plant with leaves multifarious, longer, broader, deeper green and much more copiously spotted on both surfaces; in *A. verecunda* the leaves are distichous, with the spots smaller and not spinulescent. In *A. Vossii* the spots are longer and more narrowly elongate, frequently subtuberculate and with a short firm white spine. Another striking feature is the green, fleshy, white-bordered sterile bracts, the lowest sometimes reaching 12 cm. in length, with hard raised spinulescent spots, and with their margins dentate. The perianth is less ventricose, more tapering from base to mouth, and more flame coloured.

In leaf, and especially in the sub-tubercular spinulescent spots, it is near the Albany Division form of *A. micracantha* Haw., but the latter is readily distinguished by its larger differently shaped flowers.[3]

The species is described from plants which flowered in Johannesburg during February, 1935 and 1936, and which were originally collected by Mr. Harold Voss in the Zoutpansberg. As is the case with other *Leptoaloes*, this species can be freely watered, and is one well worth cultivating.

Description.—Herb succulent, stemless or shortly caulescent. *Leaves* 14—20, multifarious, up to 3 cm. broad at base, gradually attenuate and up to 50 cm. long, rather fleshy; upper surface concave low down, more canaliculate upwards, the margins involute near apex, deep green, with several scattered elongate narrow white spots, the spots occasionally sub-tuberculate and spinulescent; lower surface convex copiously spotted near base, gradually more distant upwards, the basal spots rounder, those above more elongate, the spots with a hard tubercular excrescence and frequently with a short firm pungent white spine; the margins with extremely narrow thin white cartilaginous edge, armed with firm white deltoid teeth up to 2 mm. long and 2—4 mm. distant low down, gradually smaller upwards, minute at apex, sometimes bifid. *Inflorescence* simple, up to 50 cm. long, usually a little shorter than the longest leaves, a second appearing after the first. *Peduncle* flattened

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[2] *Vide* Trans. Roy. Soc. of S.A., vol. 5, Part 6, 1916, p. 704, Plate L.

[3] *Vide* Curtis, Bot. Mag. (1821), tab. 2272.

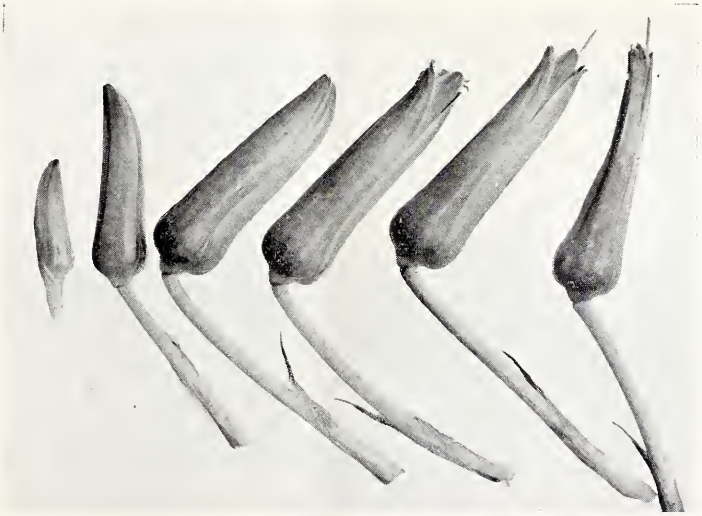
low down, terete above, 8—10 cm. diam. copiously sterile-bracteate from about the middle, the lowest sterile bracts up to 12 cm. long, 14 mm. broad, fleshy, leaf-like, sometimes with a few sub-tuberculate, subspinulescent white spots and with margins dentate near apex ; the sterile bracts gradually smaller upwards, sometimes sub-imbricate, those above up to 20 mm. long, 10 mm. broad, ovate-acute, amplexicaul, rather fleshy, green, the nerves not visible, the margins with distinct white border. *Raceme* capitate, about 8 cm. long, 7 cm. broad, very slightly conic, the buds densely congested and slightly shorter than their bracts, the open flowers laxer, cernuous, becoming erect after pollination, flame-scarlet, green tipped. *Pedicels* 30 mm. long, longer in the fruit, green. *Bracts* ovate-acute, 16 mm. long, 11 mm. broad, clasping the pedicels, rather fleshy, green, with white marginal edge. *Perianth* flame-scarlet, 28 mm. long, cylindric rather trigonous, 8—9 mm. diam. at base, slightly narrowing to the throat, the base rotund and shortly stipitate. *Outer segments* free to base, obscurely nerved, with sub-obtuse slightly spreading greenish apices. *Inner segments* free, narrower at base and broader near apex than the outer, with thin white margins and a slight keel pale orange for its greater length, greenish at apex, the apices more obtuse and slightly more spreading than the outer. *Filaments* flattened, the 3 inner narrower and lengthening in advance of the 3 outer. *Anthers* not, or very shortly (1 mm.) exserted. *Stigma* at length exserted 1 mm. *Ovary* 6 mm. long, 2·5 mm. diam., finely 6-grooved, green. *Capsule* 18 mm. long, 8—9 mm. diam., finely 6-grooved, green.

Aloe agrophila, Reynolds. Species nova et distincta in sectione *Leptoaloum*, *A. Boylei* Bak. affinis, sed foliis angustioribus, dentibus minoribus remotis, et habitu florum differt.

Acaulis vel brevissime caulescens. *Folia* 10—15, multifaria, usque ad 40 cm. longa, e basi 4—6 cm. lata sensim acuminata, carnosula, tenuia, sub-erecta vel patula ; supra sub-canaliculata, maculis parvis albis adspersa ; subtus, rotundata, basin versus maculata, marginibus denticulis cartilagineis parvis remotisque ciliata. *Inflorescentia* simplex, 50—60 cm. longa. *Pedunculus* superne bracteis vacuis plurimis ovato-deltoideis scariosis plurinervis praeditus. *Racemus* densus, capitatus, circiter 9 cm. longus et 10—11 cm. latus. *Pedicelli* 30—40 mm. longi. *Bracteae* ovato-acuminatae, sub-carnosulae, plurinerviae, 15—20 mm. longae. *Perigonium* 36 mm. longum, cylindraceum, rectum, faucem versus levissime ampliatum, basi breviter stipitatum ; segmenta exteriora libera, obscure 3—5 nervata, sub-acuta ; interiora libera, leviter carinata. *Genitalia* demum 1—2 mm. exserta. *Ovarium* 6 mm. longum, medio 2·5 mm. diam. *Capsula* 30 mm. longa, medio 12 mm. diam.

PLATE V.

Aloe agrophila, Reynolds. Flowers 1/1 from a plant flowering at Mlengana, 30 miles east of Umtata, Pondoland, Jan. 19, 1936; from the bud to post-pollination stage.



Aloe Boylei, Bak. Flowers 1/1, from a plant flowering 30 Dec., 1935, in the Biggarsberg, near Pomeroy, Natal; published for comparison with *A. agrophila*.

Fig. 1.

Fig. 2.

Plate VI. *Aloe Broomii* Schonl. var. *tarkaensis* Reynolds.

Fig. 1. A flowering plant, 10 miles south of Tarkastad, 2 Feb., 1936, with two crowns.

Fig. 2. Flowers 1/1, from the bud to the post-pollination stage.

Hab.: Pondoland: grassy slopes of Mlengana, 30 miles east of Umtata on the road to Port St. Johns, fl. 19th January, 1936, Reynolds 1749! (type) in National Herbarium, Pretoria (Plants in Garden of Division of Botany, Pretoria, No. 934.1.36.) (Plate V.)

This attractive new species is related to *A. Boylei* Bak. in the section *Leptoaloe*. From a short distance, it could be mistaken for *A. Boylei*, which it closely resembles in general habit of growth, but in leaf, and floral characters there are many differences. The leaves of *A. agrophila* are usually longer and narrower, while the marginal teeth are smaller and more distant.

The principal distinguishing difference is the smaller very differently shaped flowers. In *A. Boylei* the perianth tapers to the mouth from a broad base (about 12 mm.) while the outer segment margins are rather involute, giving the flower a distinctly 3-grooved appearance. In *A. agrophila* the perianth is more cylindrical, only about 8 mm. broad at base, slightly enlarging towards the throat, and more roundly trigonous.

The only other species to be considered is *A. micracantha* Haw, but this differs with leaves much narrower and much more copiously spotted on both surfaces and with larger, broader flowers, slightly narrowed above the ovary.[4]

A. agrophila occurs in some numbers on the grassy slopes of Mlengana, 30 miles east of Umtata on the road to Port St. Johns, while the author has also collected it 7 miles further West near Libode, Pondoland, and near the foot of Ntywenka, 21·5 miles south-east of Maclear on the road to Tsolo, East Griqualand. It is a grass-loving species (which suggests the specific epithet), and is found on steep slopes or flatter country, usually in grass 1—2 ft. high. Owing to very inclement weather, it was not possible to photograph a flowering plant at Mlengana, but a photo of the flowers is herein reproduced, together with the flowers of *A. Boylei*, for comparison.

Description.—Stemless, or with very short stem. *Leaves* 10—15, multifarious, up to 40 cm. long, gradually attenuate from a 4—6 cm. broad base, green and somewhat fleshy, rather thin, suberect or slightly spreading; upper surface sub-canaliculate, with a few scattered, white, narrowly-elongated spots; lower surface convex, more copiously spotted near base; the margins with exceedingly narrow white cartilaginous edge, the teeth white, firm, 1—2 mm. long, and up to 5 mm. distant. *Inflorescence* 50–60cm. long, 1—2 from a rosette. *Peduncle* slightly flattened low down, semiterete above, with several ovate-acuminate subamplexicaul thin scarious many-nerved sterile bracts in upper third. *Raceme* capitate, about 9 cm. long and 10—11 cm. broad, the buds erect,

[4] *Vide* Curtis, Bot. Mag., t. 2272.

the open flowers pendulous, pale coral-pink, green tipped. *Pedicels*, the lowest 30—40 mm. long, lengthening to 50 mm. in the fruit. *Bracts* ovate-acuminate, thin, subscarious, many nerved, about half as long as the pedicels. *Perianth* 36 mm. long, cylindric, about 7 mm. diam. at base and enlarging very slightly towards the mouth, the base tapering into the pedicel and slightly stipitate. *Outer segments* free, very obscurely 3—5-nerved, the nerves turning brownish-green at apex, the apices subacute, scarcely spreading. *Inner segments* free, not cohering dorsally to the outer, narrower at base and broader near apex than the outer, marked with a slight keel pinkish in lower portion turning green at apex, the apices straight. *Filaments* pale lemon, flattened, the 3 inner narrower and lengthening in advance of the 3 outer. *Anthers* very shortly (1—2 mm.) exserted. *Stigma* at length exserted 1—3 mm., and remaining exserted after pollination. *Ovary* oblong, 6 mm. long, 2·5 mm. diam. at the middle, finely 6-grooved, light green. *Capsule* oblong, green, 30 mm. long, 12 mm. diam. at middle, 6-grooved, enwrapped with the remains of the dry perianth.

Aloe Broomii Schonl., var. **tarkaensis,** Reynolds. Varietas nova et distincta, a forma typico foliis dentibusque majoribus, bracteis brevioribus exsiccatioribusque, floribus longioribus et praesertim bracteis nec dense imbricatus nec floribus et alabastris obtectis differt.

Hab. : Cape Province ; Tarkastad Division, 10 miles south of Tarkastad on the Bedford road, fl. 2nd February, 1936, Reynolds 1776 (type) in National Herbarium, Pretoria ; rocky slopes 3½ miles south-west of Tarkastad, fl. 2nd February, 1936, Reynolds 1777 in National Herbarium, Pretoria. (Plate VI.)

This very distinct variety differs from the typical in its more luxuriant growth, the rosettes sometimes reaching 3—4 feet in diameter ; the leaves are 2—3 times broader at base, often recurved, and more glossy reddish to brownish-green in colour, with the margins more strongly sinuate-dentate. The most striking character, and one by which the variety is immediately recognised, is the inflorescence.

In Schonland's typical form (which is described with " bracts nearly 3 cm. long, the perianth 2 cm. long ")[5] the densely imbricate long fleshy pale green bracts completely obscure the shorter buds and flowers, giving the raceme a smooth appearance, with only the exserted portion of the genitals being visible.

In the var. *tarkaensis* the bracts are dry, brown, and considerably shorter, the individual buds and flowers being clearly visible. In structural characters of flowers it differs little, but the perianth is longer, often 30 mm., and more markedly stipitate at base.

[5] Rec. Albany Mus. II (1907), 137.

Another feature of the variety is that it flowers in February, while the typical form in the central and northern parts of the Cape, the southern Orange Free State and Basutoland, flowers in August—September.

The variety occurs in the most south-easterly station known for the species, and although also found near Cradock, appears to have its headquarters in the Tarkastad District, on which account the varietal epithet is proposed; it is described from personal observations near Tarkastad during January—February, 1935-36.

Description.—Stem usually simple, sometimes dividing at the summit into 2—3 crowns, short or up to 1 met. long, the old dry leaves persistent. *Leaves* densely rosulate (the rosette up to 1·3 met. in diameter), broadly ovate-lanceolate, attenuate in upper third, terminating with a pungent spine, with 5—15 cm. of the apex dry; upper surface flat near base, gradually more canaliculate upwards, lower surface flat or slightly convex low down, more convex upwards, sometimes carinate-dentate in upper third, with teeth 1—2 mm. long, 5—10 mm. distant; both surfaces somewhat glossy reddish to brownish-green in colour, obscurely lineate; the margins strongly sinuate-dentate, the horny edge reddish-brown, the teeth deltoid, with pale brown apices, smaller and more crowded near base, gradually larger and up to 10—15 mm. distant near apex, the interspaces rounded. *Inflorescence* simple or sometimes with 1—2 branches, 1—3 from a rosette, up to 1·5 met. in length. *Peduncle* semiterete above, flattened and up to 6 cm. diam. low down, copiously sterile bracteate, the bracts ovate-acuminate, spreading, thin scarious brown many-nerved, the lowest up to 40 mm. long, 20 mm. broad, smaller upwards. *Raceme* cylindric, slightly acuminate, up to 1·25 met. in length, 13 cm. diam., densely multi-flowered, the buds suberectly spreading, green, obscurely striped, sometimes with brownish apices, not obscured by their bracts. *Pedicels* 3—4 mm. long. *Bracts* long-ovate, up to 15 mm. long, 6 mm. broad, thin scarious brown many nerved, with obtuse cuspidate apices. *Perianth* 28—32 mm. long, cylindric, slightly curved, shortly stipitate at base, lemon in colour. *Outer segments* free, 5—7-nerved, the nerves pale green and converging to a brownish apex, the apices sub-acute, straight. *Inner segments* free, broader than the outer and with more obtuse apices, carinate with 3 congested nerves, the margins thin and white. *Filaments* sub-filiform, flattened, the 3 inner narrower and lengthening in advance of the 3 outer, the included portion yellow, the exserted part orange. *Anthers* exserted 7—15 mm. *Stigma* at length exserted up to 15 mm. and remaining exserted after pollination. *Ovary* 5 mm. long, 2·5 mm. diam. tapering into the style, finely 6-grooved, pale lemon in colour. The leaf sap dries deep brown.

THE TRAP OF UTRICULARIA CAPENSIS—HOW IT WORKS.

(With Plates VII—X.)

By Francis E. Lloyd, M.A., D.Sc., F.R.S.C., F.L.S.

Just previous to the meeting of the B.A.A.S. in Cape Town in 1929 I had the opportunity of studying the trap (usually and less preferably the "bladder") of *Utricularia capensis*, and ought at that time to have ascertained the facts which would have enabled me to interpret correctly its mode of action. I was then rather new to the game, for it was only in the previous winter that I had been able to show definitely that the traps in *U. gibba* and *vulgaris* (and by implication others of that type) act in a purely mechanical manner, conditioned by the watertight character of the door; and this I showed to be due to the presence of a membrane—a second valve in fact—sealing the chink between the door edge and the threshold on which it rests. The Cape Town opportunity enabled me to satisfy myself that what was in general true of *U. gibba* is also true of *U. capensis*. The anatomical facts observed and the behaviour of the trap in general were later published; but it must be admitted that only much later was an adequate understanding of the precise manner of working of the entrance mechanism attained. The first light was seen when the living material of *U. cornuta* became available and was studied in 1932 (Lloyd, 1933) that a definite hint as to the behaviour of *U. capensis* was had. This was completely verified by a study of living material of *U. Welwitschii*, grown for me from seed in the Edinburgh Botanical Garden (Lloyd, 1935). This species is like *U. capensis* except in the number and arrangement of the combs of glandular trichomes borne on the surfaces about the entrance. Nevertheless the opportunity to study *U. capensis* itself in the living condition (my chief purpose in visiting Cape Town) was not to be missed, and the effort to do so has been justified in the clarity of the evidence afforded, due in part to the unexpected translucency of its very small traps (0.5—1.25 mm. in length.) It is the purpose of this paper to give the results obtained.

Shape and Dimensions of the Trap.

The trap (pl. VII—1) is a hollow organ laterally compressed and neatly pear-shaped as seen from the side, with its stalk however attached in the middle of the thicker end. As thus seen, the opening into it is at

one side of the narrow end, and is circular (pl. VIII—2). The narrow end of the pear is flattened into a rostrum bearing six rows of stout glandular hairs radiating toward the centre of the opening: "upper lip fimbriated," as the taxonomists say. On the opposite side of the opening there are six rows of similar but stouter hairs, also radiating toward the centre of the opening ("lower lip fimbriated," though here a "lip" is not present). These hairs secrete mucilage to which mud particles, etc., may adhere abundantly. Their position suggests them to be guides flanking grooves along which minute animals are guided toward the opening which leads to a tube, as Miss Stephens (1930) called it, narrowing, when viewed laterally, toward the inside. One side (conventionally the upper) of the tube is occupied by a valve or door. The rest of the wall of the tube is divided into two regions, the forward (the forestep) lined with glandular hairs of graduated sizes, the outermore the longer: and the inner (pavement epithelium) clothed with crowded short glandular hairs, being more and more crowded towards the inside of the trap. This will be described more particularly beyond. The whole surface crowns a massive thickened portion of the wall, the threshold ("collar" of Darwin, though he did not see this species) since the door edge rests against it. The simple diagram herewith will enable the reader to visualize this (fig. 1).

If one looks directly into the entrance one will see that the glandular hairs lining the tube are placed radially, falling short of meeting in the middle (pl. VIII—2). They thus bar the entrance except for a narrow tubular passage formed by their ends. The effective passage so formed permits the entrance of minute animal forms, such as cyprids, nematode worms, etc., though the hairs can bend sufficiently to allow larger forms to enter, up to a certain limit. The outer surface of the door also bears glandular hairs of short curved form which complete the circle of the passage, or, when the trap is not in the set condition, block the entrance entirely (pl. IX—1, 2).

With regard to the remaining structural details of the trap it should be pointed out that the wall is in general composed of two courses of cells (there are more in the threshold), the outer of shallow cells, the inner of deeper ones (pl. VII—1, 2).

Surrounding the entrance the wall is considerably thicker, and, with the threshold (which is of course a part of the wall) can resist deformation by the side walls as they move in and out according to the changes in the water content of the interior. Scattered and inserted between the cells of the outer course are sessile glandular cells secreting mucilage and in similar situations on the interior occur glandular hairs with four transversely placed arms, called by Darwin quadrifids (pl. VIII—5); but on the

inner surface of the threshold, these are either simple or bifid (pl. VIII—7). The arms are cylindrical, bluntly ended. These internal glands are secretive (of digestive enzymes) and at the same time absorptive, this statement subject somewhat to the ultimate definite proof of the exact nature of the digestive process. All these hairs agree with the general type peculiar to *Utricularia* in consisting of a fundamental series of three cells, the basal, sunk into the epidermis, a small mid-cell, cutinized and small, supporting the end cell or cells devoid of cuticle, since it is early thrown off, permitting in many cases of the secretion of mucilage. In some species (e.g., *U. vulgaris*) the quadrifids are extremely numerous; in other, as in *U. capensis*, quite few.

How the Trap Works.

We are now in position to examine into the precise working of the trap. First of all it must be understood that the walls have the power of excreting water from its interior. (Nold, 1934.) Since the trap is watertight (as we shall later see), this excretion results in a reduced volume of water in its interior, resulting in the partial collapse of the more extensive lateral walls so that in this condition they are concave, regarded from the outside.

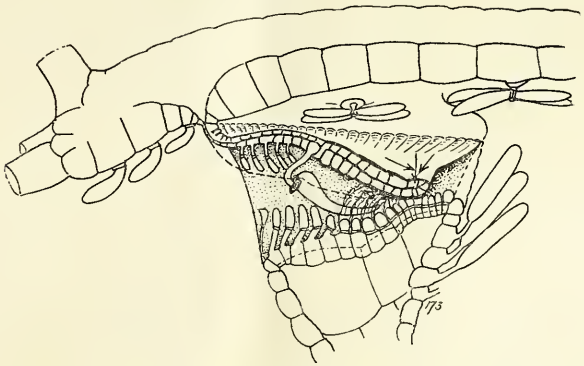


Fig. 1. Diagram of sagittal section of *U. Welwitschii*. The door in set posture. Broken line indicates the relaxed posture. *Cf.* pls. VIII. IX; figs. 3 and 4.

The collapse of the walls proceeds without distorting in the least the mass of tissues about the opening, which, as explained above, are more massive, and are jointed with the walls by a thinner hinge.

If one punches a minute hole through the wall with a needle point, water can gain access to the interior, when the walls bulge outwardly

and become strongly convex. (Merl, 1921). The whole system is now in equilibrium; the trap is relaxed. In this condition it is incapable of catching prey. When the walls are concave, on the other hand, the trap is in a condition of "unstable equilibrium" as Brocher (1911) first said; that is, the trap is *set*. This brings us to the question of how the condition of "unstable equilibrium" is maintained, and what happens when the trap is actuated.

We know that when the trap is set the outer water is pressing on every portion of the outer wall, including of course the valve or door. As compared with the relatively rigid wall, the valve is very flexible and tends to yield to the pressure of the outside water. While, however, it yields there comes a point when it yields no more, and as long as only the water presses on it, it remains in equilibrium (fig. 1, pl. IX, X). If, however, an uneven pressure is brought to bear on it, it can no longer resist the water pressure and it is momentarily forced open by the water which rushes in, sucked in by the outwardly springing wall, just as a compressed rubber ball will expand when released and suck in air or water through a hole in its side. Owing to the physical properties of the valve, being flexible but strong and having a set form, it closes again, cutting off the inrushing water at slack tide *before the walls are completely expanded*, but now comes into a different position, that which it takes under an approximately minimum water pressure. This is the relaxed posture (pl. IX—2; X—2) when it cannot act and the trap cannot catch prey. As the water is excreted from the interior—this goes on continually—the pressure of the outer water steadily increases, and the valve gradually comes into its original, that is, the set posture of "unstable equilibrium" ready to be again actuated. The process of excretion occupies, in *U. vulgaris* and other similar species about a half-hour, in *U. purpurea* about two hours. In *U. capensis*, judging from a few observations, it takes about an hour. Aside from the process of water excretion, the operation of the trap is purely mechanical, although it should be said that attempts have been made to show that the mechanism is an irritable one (Kruck) and it is to the credit of Darwin (Insectivorous Plants) that he rejected this view. The opening and closing movements of the valve are very rapid, the former about four times as rapid as the latter (since the closure is against inflowing water). In *U. vulgaris*, as ascertained by means of moving pictures taken at the rate of 160 exposures per second, the opening takes one frame (1·160″), the closing 4·160″, in all 1·32″, an exceedingly rapid movement. That a plant organ should be capable of making such a rapid movement of displacement and restoration is most astounding, when, as we know, plant cells are clothed with a cellulose wall. So far as I know the only movements comparable in point of speed

are those of cilia and flagella in protista. Other movements due to irritability (leaf movements of *Mimosa*, stamens of *Berberis*, stigma lips of *Diplacus*) are very slow in comparison: while results due to mechanisms set up in ripening fruits causing the ejection of seeds act rapidly, they are due to the action of ejecting pollinia, of dried dead parts under tensions. The action of the fruit of *Impatiens* and of parts of the flower in some orchids are similar, but here the walls are still living. In all these, however, the action is irreversible. It is worth while to endeavour to understand the entrance mechanism, that is to say, the minute structure of the valve and threshold (for they work together) in order to form an adequate conception of how all this behaviour is accomplished.

It was for long thought that the door in *Utricularia* acts as a simple check valve, comparable to the check valves of our veins (but here they are double), and that prey, attracted by some lure (mucilage probably) made its entrance by pushing up against it (fig. 2). After passing in, the

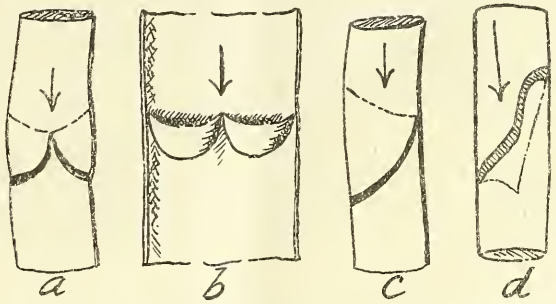


Fig. 2. Diagrams of simple check-valves in the veins (*a*, *b*), an imaginary single check valve in a vein (*c*) and (*d*), the door or valve of *U. capensis*. Arrows indicate the direction of flow of blood which is prevented. In (*d*), the flow is not prevented unless there is a special mechanism to stabilize the door.

valve fell passively into place and prevented exit. Darwin, Cohn and many others held this view, and it is the one prevalent in textbooks even now. Small in his text book affords an exception. It was not till 1911 that, as the result of the observations of the entomologist Brocher of Geneva, it was clearly indicated that this idea was untenable. He saw that there was a reduced pressure of water in the trap, which could not be the case if the door is a simple check valve; and further, that the door must be watertight, but his idea of the mechanism involved was incorrect. Nevertheless he observed that the prey is caught instantly (as indeed had Darwin) but, though he suspected that the action could be repeated, did not find out if this is the case. This observation was made first by

Merl (1921) and then by Czaja (1922) who timed the intervals between possible actions, the minimum period Merl found, for *U. vulgaris*, to be 15 min., but this is unusual, 30 min. being usual. It is evident from such observations that the *Utricularia* trap valve can offer resistance to the mass movement of water under pressure tending to flow in the direction *opposite to that in which it should go* to be checked by a simple check valve (fig. 2).

We now ask ourselves the question, what sort of mechanism can succeed in doing this. As pointed out above the entrance of water is not gradual ; it does not ooze in, but rushes in suddenly and in a large stream, which is eventually stopped by the back movement of the valve *before the walls of the trap have expanded to the full.* That is, the valve has an intrinsic tendency to assume a certain posture, just as has the roof of a bowler hat : it is in fact of a certain definite shape which in itself procures closure of the passage against the flow of water, *if the pressure is not too great.* If we dissect away a door we find that its shape is retained even after separation from the trap. If the pressure of water is increased (as it must be on excretion of water from the inside of the trap) still water cannot leak in under the edge of the valve ; even the available maximum water pressure *alone* cannot do this. Since when water enters, it does so suddenly, we may believe that a latch of some sort has been brought into action. Where is the latch ? In order to make the problem clear by means of an analogy, imagine a door supplied with a slip latch[1] —the kind which gives when one pulls on the door hard enough without the necessity of turning a knob. It is obvious that such a door when closed would withstand a certain wind pressure, but a blast of a " black south-easter "[2] would blow it open and the opening would be sudden. If the door were provided with a spring, it could close against some wind pressure, so that the analogy is complete, except for the fact that the *Utricularia* door is not flat and rigid, but a flexible valve. This brings us to the precise question of the construction of the door or valve.

The Door.

A dissected-out door when pressed out flat—(having a set form it does not of itself become so)—is roughly triangular, rounded at the narrow end, the broad edge slightly scalloped into three reaches, the middle and two lateral (fig. 3). It is quite evidently divided transversely into two regions, the upper (at the apex of the triangle) and the lower, all the rest, the line of division being above the middle point, so that the upper region

[1] Called a " Bayle's latch " in the furniture trade.

[2] Capetown's boisterous summer wind.

is the smaller. The upper region is seen to bear a group of rather closely packed, short, downwardly curved glandular hairs (fig. 1); and at the lower edge of the group there is a single large hair having the shape of a Malay kriss, hence called the "kriss trichome" (pl. VII—4; fig. 1, pl. VIII—9). The lower region is smooth.

Again, when the door is relaxed and under no restraint, the upper region is concavo-convex, convex outwardly with respect to the interior of the trap (figs. 1, 3). The hairs are therefore on the convex

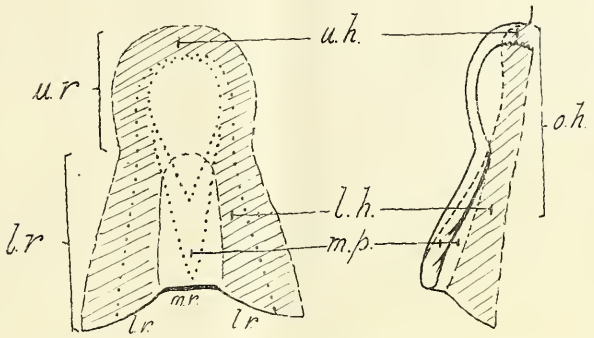


Fig. 3. Plan of door in *U. capensis*. u.r., upper region; l.r., lower region; u.h., upper hinge; l.h., lateral hinge, together constituting the outer hinge. Dotted lines indicate the curvatures of the door on opening. l.r. lateral reach of door edge; m.r. middle reach of door edge. Broken line (right-hand fig.) indicates the set posture of the door.

surface. The lower region is circularly curved transversely (pl. VIII—8), the curvature corresponding in form to that of the threshold on which the door edge rests. In the third place the upper region is thin (pl. VII—4), the lower thick, consequently the former more, the latter less, easily bent. All parts are quite flexible and can be bent into all degrees of curvature with complete recovery on release, in which respect the tissues are highly peculiar. One is reminded of the annulus of ferns, or the mechanical tissue of anthers, but neither of these behaves as does the *Utricularia* door. The explanation of this is to be found in the minute structure.

In the first place the walls of the cells appear to be highly flexible. Chemical tests have so far failed to reveal any differences as compared to ordinary cellulose walls, but much handling in an experimental way indicates that there are. Pure cellulose walls when wet are of course rather flexible in any case.

In the next place the forms of the cells contribute very largely to the flexibility. The whole door is composed of two courses of cells, an outer (with respect to the trap as a whole), which is histologically continuous with the outer course of cells of the trap wall (fig. 1); and an inner, continuous with the inner course of wall cells. The door is indeed a thin outgrowth of the trap wall. In the outer zone of the upper region the outer cell course is very thin indeed, becoming thicker as the lower region is reached. Conversely the inner course is thicker in the outer zone, and is on the inner surface deeply corrugated concentrically with respect to the outline of the door. The cells themselves are rather longer than broad, their major axes arranged radially. There is thus produced a bellows structure which gives great amplitude of bending movement precisely where the greatest flexibility is needed. Similarly the outer lateral zones of the lower region exhibit a similar structure, the whole outer zone of maximum bending constituting a sort of hinge, the outer hinge (pl. VIII—8; fig. 3).

The middle area of the upper region can bend, but not sharply, merely becoming concave (when the trap is set) or convex when relaxed (fig. 3). There is of course no sharp line of demarcation between the hinge and middle area.

The lower area is much thicker than the upper and has thicker walls and very deep corrugations; somewhat oblique to the axis of the door and approximately parallel to its line of attachment to the wall. Its middle area (the middle piece), the lateral limits of which are indicated by the extent of the middle reach of the free edge, is the thickest and more massive, and is capable of sharp bending along its axis (fig. 4). My

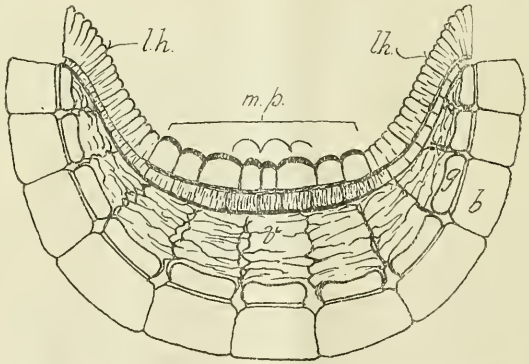


Fig. 4. Diagram of transverse section of entrance to show the deep corrugation of the middle piece, and the cells of the pavement epithelium providing the velum. g., gland (capital) cell; b., basal cell. The thin cell between is the mid-cell. v., velum; m.p., middle piece with deep corrugations; l.h., lateral hinge.

photographs of *U. Welwitschii* (pl. VIII—8) taken transversely through the door in this region indicate that there is a line of greater flexibility along the axis due to the meeting of deep parallel corrugations; the same is true of *U. capensis*, so that when the door opens under water pressure there can occur a momentary sharp longitudinal bending, leading to a reversal of curvature during the initial rush of water.

All the cells of the door have this in common, namely, that lateral (anticlinal) walls are very thin but are supported by numerous local thickenings, called props (Meierhofer: *U. vulgaris*, 1902) placed at right angles to the general surface of the door (fig. 5). The thin walls are easily bent but the collapse of the cells when under the strain of bending is prevented by the props. In the living door the cells are of course under

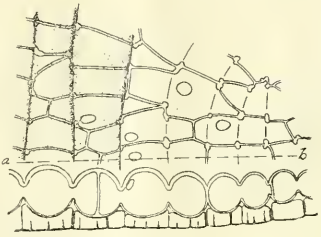


Fig. 5. Diagram to indicate the structure of the walls (in *U. vulgaris*) giving the bellows effect.

turgor pressure, and, since the sap is non-compressible, the thin walls by bending and stretching allow the transmission of pressures in any necessary direction. The outer walls, forming the surface of the door, are thicker, the bending movements being facilitated, as above said, by the corrugations which afford a bellows effect. While, as said, the hinge zone of the lower region is highly flexible the outer course of cells being thin and the inner corrugated, in the middle part opposite the middle reach, the courses are of approximately equal thickness, and the whole quite massive. This is called the middle piece, and is of importance in receiving the lateral thrust of the lateral hinges, so maintaining the posture of the lower region when the trap is set (fig. 4).

The Threshold
(pl. VIII—1, 7, 8).

We must now glance at the threshold. This term is applied to that mass of tissue supporting the entrance mechanism and continued as a thick mass of tissue surrounding the entrance. It is lined on its curved

surface with glandular hairs of various kinds in regard to size and function. This surface when seen in transverse sections of the trap spreads around *ca.* 2/3 of the surface at the outer opening (pl. VIII—2) and one-half at the inner. The oblique lateral lines of limit are the lines along which the attached edge of the door lies. The passage from outer to inner opening is, however, not cylindrical, the inner opening being the narrower; nor is the gradient a continuous one, but is marked by three changes (pl. VIII—1), each stretch occupying about one-third the distance from outer to inner opening. The first (the forestep) is *ca.* parallel with the roof, and is lined with rows of stalked glands, longer at the opening and shortest at the inner limit (fig. 1; pl. IX—1). Beyond this the floor rises at a slight angle (so that the transverse section of the

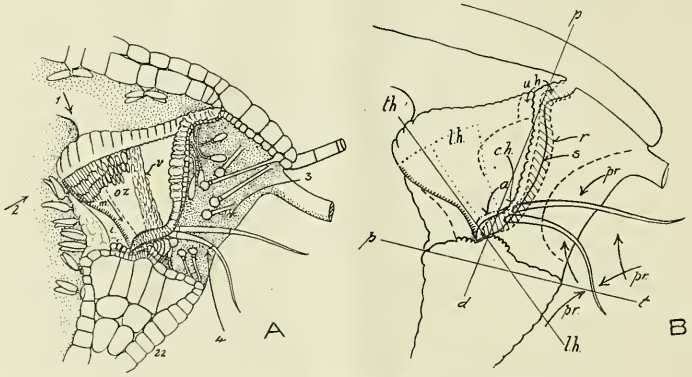


Fig. 6. (A) Diagram of the entrance mechanism in *U. gibba*. v., velum; o.z., outer zone of pavement epithelium; m., its middle zone and i., its inner zone. Arrows 3, 4 indicate the direction of movement of prey in touching the bristles and so activating the trap.

(B) Diagram showing how the door is stabilized when under water pressure. s., set; r., relaxed postures. a., disturbed posture due to touching of the bristles in directions pr. P.d., thrust of door; th-lh. thrust of lateral hinges (l.h.); p t, general level of the threshold; c. h., central hinge.

entrance becomes narrower) and is clothed with rather closely-packed sessile hairs (pl. VII—4), the cuticles of the outer or capital cells of which are much expanded or ballooned, and constitute collectively a valve-like filling, the velum, which plugs the angle between the door and the threshold and makes it watertight. It was first observed by me in 1929 in *U. gibba*, and it was this that led to the reinvestigation of the whole entrance mechanism. The membranes are very diaphanous, and easily escape observation. The velum occupies the outer zone of the pavement epithelium (fig. 7; pl. VIII—7). The rest of the pavement

epithelium is composed of the middle and inner zones. The former is characterised by very small compact glandular cells, and is narrower in the middle and broad at the sides of the threshold, supplying a firm and compact surface on which the door edge rests, contributing to the watertight closure. It has a slight tilt toward the outside of the trap so that it continues the gradient of narrowing. Beyond this is the inner zone of the pavement epithelium, narrow crescentic in form, and of negative value so far as we can see. The horns of the crescent coincide in position with the ends of the door edge.

The difference in posture of the whole door when the trap is set and after actuation, *i.e.* in the relaxed posture, will now be described. These different postures are to be seen in the accompanying figures, taken of living traps before and after actuation, in Jan., 1936, at Cape Town (pl. IX, X). Such figures as these are obtained by focussing the lens (4—16 mm.) in the sagittal plane of the trap so as to get a silhouette of the door and threshold. Because of the thickness of tissue through which the lens has to penetrate one cannot expect more than meagre clearness. One must be satisfied if one can make out the mere outline of the door and threshold as seen laterally. Of four pairs of negatives I have chosen the best for my purpose, while the diagram (fig. 1) furnishes a composite together with details only seen in good sections.

By comparing the two pictures in each of pls. IX and X, one of the set condition of the trap and one of the relaxed, it can be clearly seen that the upper region of the door is convex (looking from the outside) in the relaxed posture, and concave in the set. This can only be explained as the effect of differences of pressure of water on the outer surface. Since the upper and lower regions are not separated by a sharp differentiation of tissue it follows that the concavity extends somewhat into the lower region, the curvatures being harmonic. The effect of the concavity is to raise the upper part of the lower region, and so to tilt the whole into a position in which the axis of the door lies at a greater angle with the surface of the threshold so that the thrust of the middle reach of the door on the threshold is more direct. Contributory to the production of this thrust is that of each side of the door exerted transversely and these three thrusts taken together are sufficient to bring the whole door edge into firm contact with the middle zone of the pavement epithelium. It seems probable too that the strains set up by the convexities of the door result in moving the door edge slightly back (toward the inner opening), allowing the whole edge to lie smoothly by cramping it against the pavement epithelium.

In this posture the door is sufficiently raised (except, of course, at the edge) to leave an opening between the stalked hairs of the forestep and those of the upper door region, through which small animals can pass into a larger space beyond, in which they can move about. Being in such a confined space, the animal (a daphnid, cyprid, or other) moves vigorously and with sufficient energy to disturb the equilibrium of the door in its strained posture. This is by contact with the kriss hair.

I am able at long last to make this statement without fear of contradiction. Excellent material[3] brought from the Cedarberg at 4,000 ft. altitude by Professor Compton gave me the requisite opportunity for experiment as follows. I have elsewhere pointed out that the kriss trichome during development is directed toward the interior of the trap. In the mature trap, however, its position may become reversed, and the free end then is directed outward (pl. IX, X) and now lies in the narrow channel between the ends of the stalked trichomes and those clothing the upper region of the door. In this position it sticks out beyond the mouth of the channel far enough to be touched by a needle point. If, therefore, a trap with the kriss trichome in this position can be stimulated mechanically *without introducing the needle point into the entrance*, rather merely by moving it laterally across the mouth, it can be concluded that the kriss hair is the trip-mechanism. If, however, this movement of the needle does not produce results, and it must be introduced carefully so that the point enters *no further than the base of the kriss hair*, and moving toward the door, to result in actuation, this would be expected if the kriss hair is inwardly directed. Actuation when the needle did not enter the mouth was called position 1 ; when it was introduced as far as the base of the kriss hair and if then moved toward the point at which the kriss hair is inserted, this was called position 2. Of 42 perfectly clear and successful operations, 12 traps were actuated with the needle in position 1 ; 37 with the needle in position 2 ; and three cases as the needle moved from position 1 to 2. Many other cases were seen in which actuation occurred, but the course of the operation with the needle was not perfectly clear. Often the point of the needle is swallowed by the trap, and though it is perfectly clear that actuation has occurred, the movement is so rapid that it disturbs judgment. It seems quite clear, therefore, that the kriss hair is a trip-mechanism.

When actuated, the pressure of water can then be exerted to extend the concave curvature, and this then involves the middle piece throughout

[3] The plant brought in differs from that found in the vicinity of Cape Town by having linear leaves.

its length (fig. 3). There is a momentary longitudinal fold made possible by the deep longitudinal corrugations of the middle piece and in spite of the lateral thrusts of the lateral hinges on the door its transverse curvature is inverted. The water having rushed in, the tide slacks and the door by its own springiness closes again, but now comes into the relaxed posture.

In this posture the upper region is convex, and the lower region makes a narrower angle with the threshold, including of course the pavement epithelium. The angle is filled with the velum (fig. 1 ; pl. VII—4), and the whole is watertight under the diminished difference of pressure as between in- and outside the trap. As the excretion of water from within proceeds, the door gradually passes into a renewed set posture in which it again becomes mechanically sensitive, that is, in " unstable equilibrium."

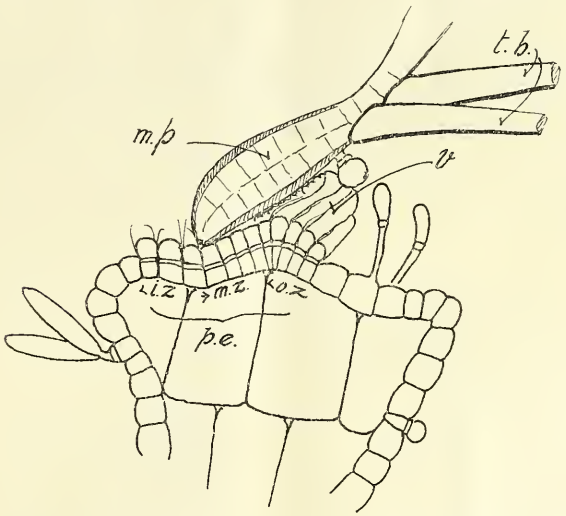


Fig. 7. Diagram showing the posture of the door edge in relation to the pavement epithelium in the set posture. t.b., tripping bristles ; v., velum ; o.z., m.z. and i.z., outer, middle and inner zone of the pavement epithelium. m.p., middle piece.

The Type U. Vulgaris (figs. 6—8).

In my previous paper in the Journal of the Botanical Society of South Africa, I based my interpretation of *U. capensis* on what I then knew of traps of an undetermined species (*U. gibba*, aff.), a plant

growing in the McGill University glasshouses, and related to *U. exoleta*, *U. vulgaris*, etc. Recent studies during the last two or three years have led me to correct my earlier descriptions in an important detail, and I take this opportunity to offer a correction.

This relates to the posture of the middle reach of the door edge in contact with the pavement epithelium. I previously described it as resting against the outwardly sloping surface of the outer zone of the pavement epithelium. Unfortunately the form I was working with lent itself too easily to this interpretation of the matter, and it was only after making use of a new method of attack that I discovered the mistake. This was to make photographs in set and relaxed postures at right angles to the sagittal plane of the trap so as to get an image of the profile of the door on the negative. It is, however, very difficult to get the entire profile owing to the amount of tissue to be penetrated optically. After a good deal of experience it was finally found possible to get at the facts.

In the set posture the edge of the door in the middle reach rests against the outer edge of the inner zone, which, because of a slight outward tilt, offers resistance to the inswing of the door. This is enhanced by the downward thrust of the door edge due to the inherent thrust of the door amplified by the pressure of the outer water upon it. In this position, the outer face of the middle piece of the door rests against the middle zone of the pavement epithelium, pressing outwardly, thus

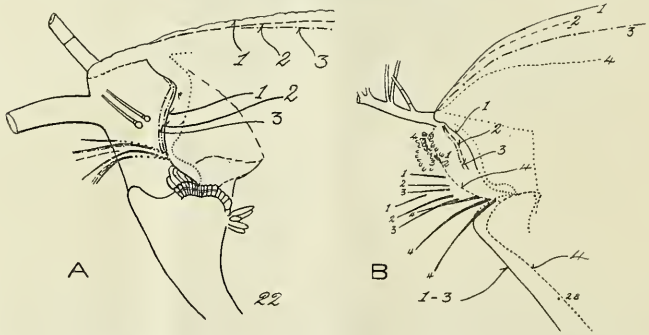


Fig. 8. Postures of the door in (A) *U. gibba* and in (B) *U. vulgaris*. 1, set; 2, relaxed (after normal activation) and 3, fully relaxed after puncturing the wall of the trap 4, in sagittal section.

making a tight joint, the watertightness of which is rendered complete by the velum which occupies, in the form of a bolster, the space between the base of the trip-bristles and the pavement epithelium.

The trap is actuated by lateral pressure on the trip-bristles in any direction. This distorts the middle piece and renders nugatory the downward pressure of the door edge, and the door, folding longitudinally under the water pressure, swings inwardly, returning swiftly back against the relaxing water current to the relaxed posture. To the eye, this is the same as the set posture, but careful measurements of projected images from lantern slides enable one to see that the profile of the door now stands a little forward (towards the opening of the trap) and the middle piece, resting with outward pressure against the middle zone of the pavement epithelium, aided of course by the velum, makes a watertight joint. In order that the pumping action of the walls may be effective at once, the door mechanism must be watertight *all the time*. but this does not mean that the door edge must rest firmly against the inner zone of the pavement epithelium. This condition is attained only as the water pressure increases towards its maximum. One must admit that it has been impossible to say precisely where the door edge rests in the relaxed posture of the door. The difficulties of observation are very great. But the forward position of the whole door profile makes it certain that there must be some difference, however small. In the diagram herewith (fig. 6B) this difference is probably exaggerated (cf. fig. 8.)

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PLATES.

Plate VII. 1, Trap of *U. capensis* with door in set posture ; 2, the same after activation ; 3, check on retouched picture, plate X, fig. 1 ; 4, door of *U. capensis* in sagittal section.

Plate VIII. *U. Welwitschii.* 1, Sagittal section of entrance mechanism. 2, Looking into the entrance : pointer indicates the door (upper region) ; 3, 4, set and relaxed posture of door taken from life ; 5, 6, outer and inner surface of door ; 7, looking down on the pavement epithelium ; 8, transverse section of door through the middle of the middle piece. 9, the kriss trichome.

Plate IX. *U. capensis.* The door in set posture, with the kriss trichome showing projecting beyond the mouth of the entrance (retouched) ; and (lower picture) door in the relaxed posture.

Plate X. *U. capensis.* Another case more highly magnified initially. The outlines of the door can be traced with considerable clearness in these pictures. The end of the kriss trichome has been retouched. See check on plate VII, fig. 3.

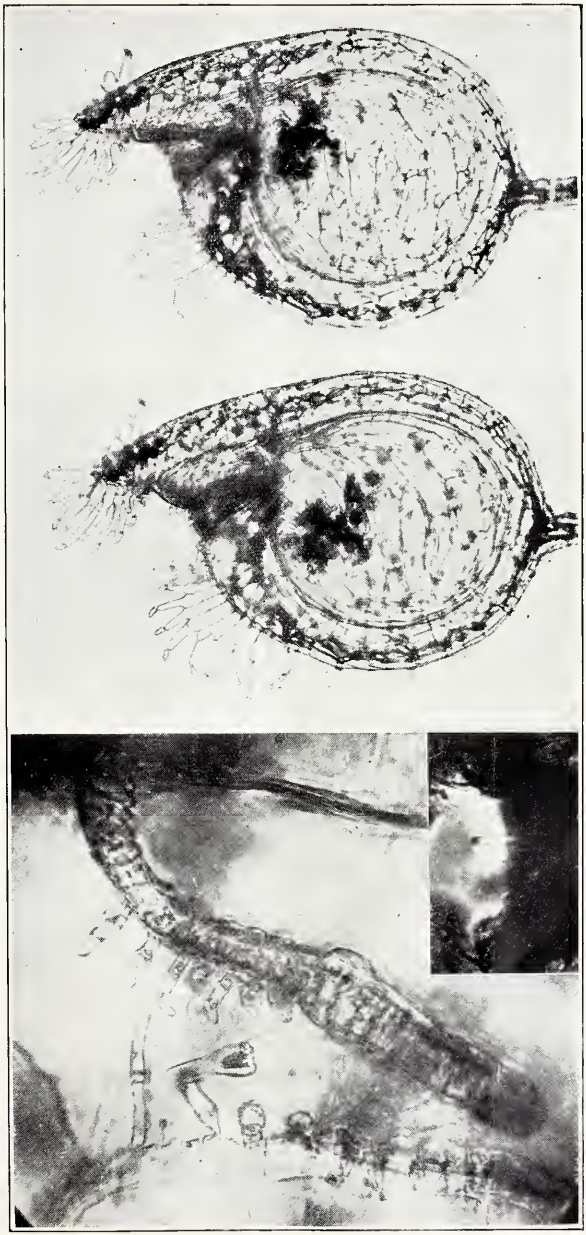

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PLATE VII. UTRICULARIA CAPENSIS.

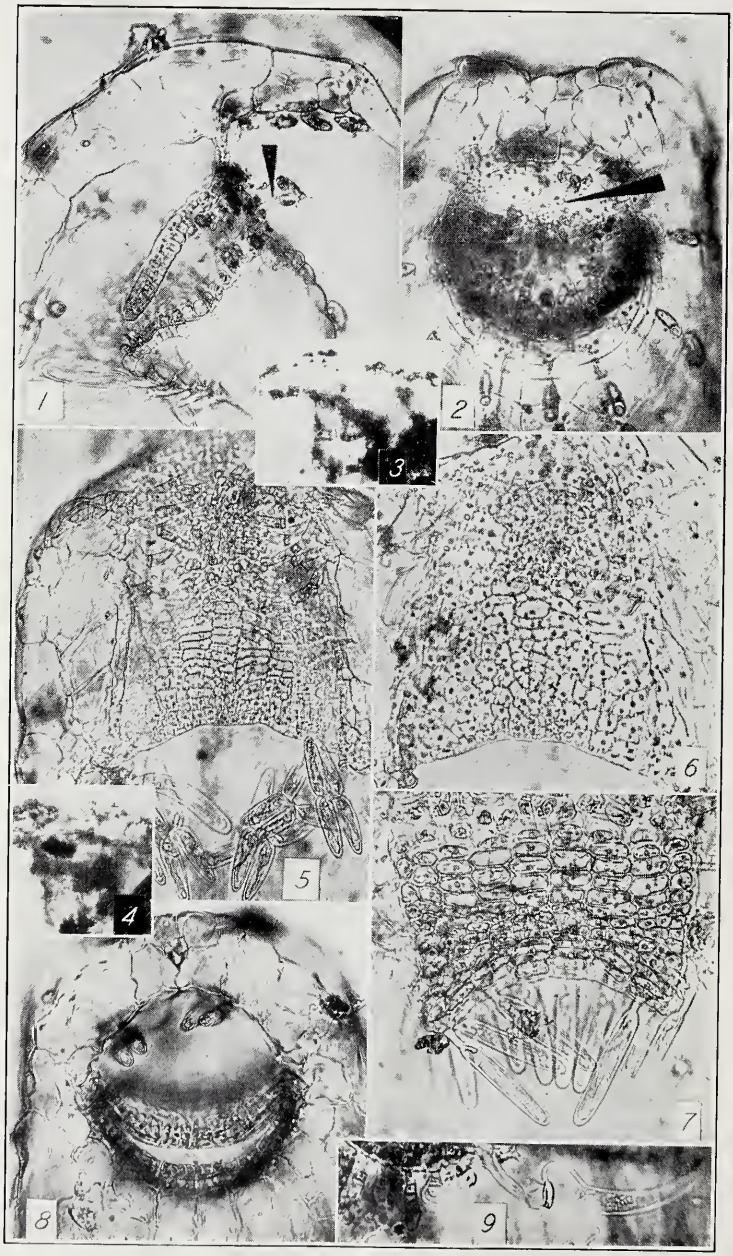

PLATE VIII. UTRICULARIA CAPENSIS.

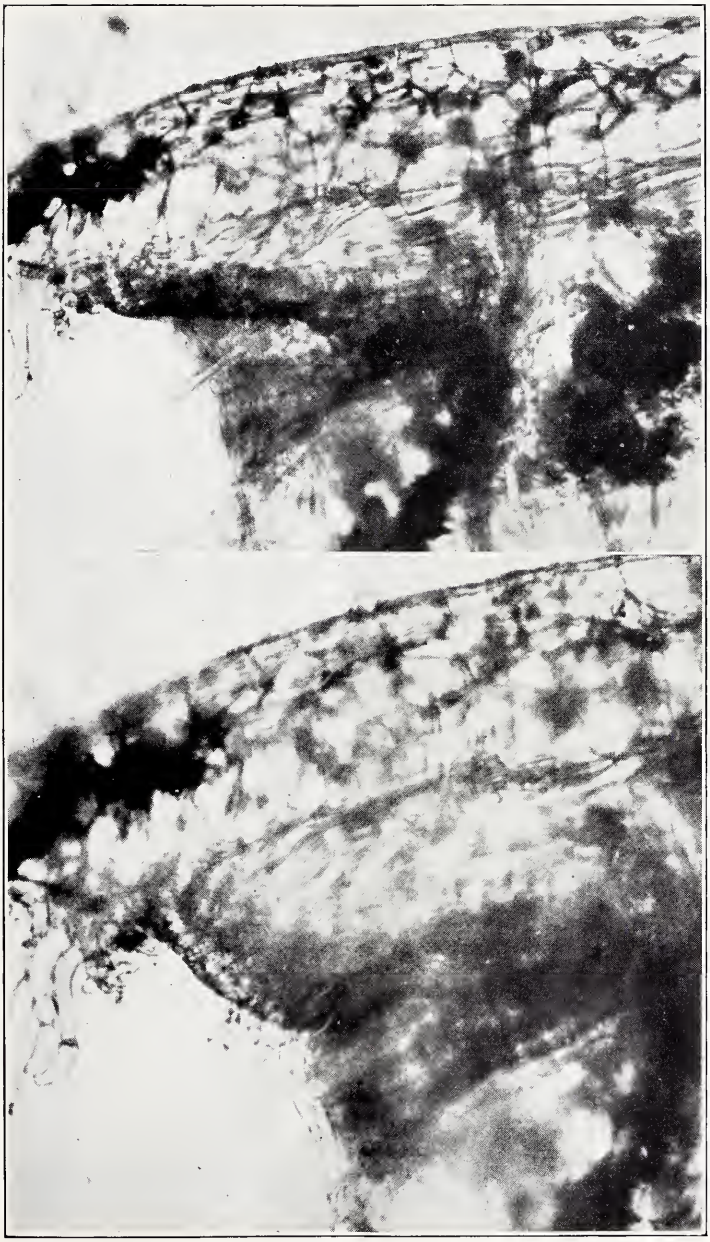

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PLATE IX. UTRICULARIA CAPENSIS.

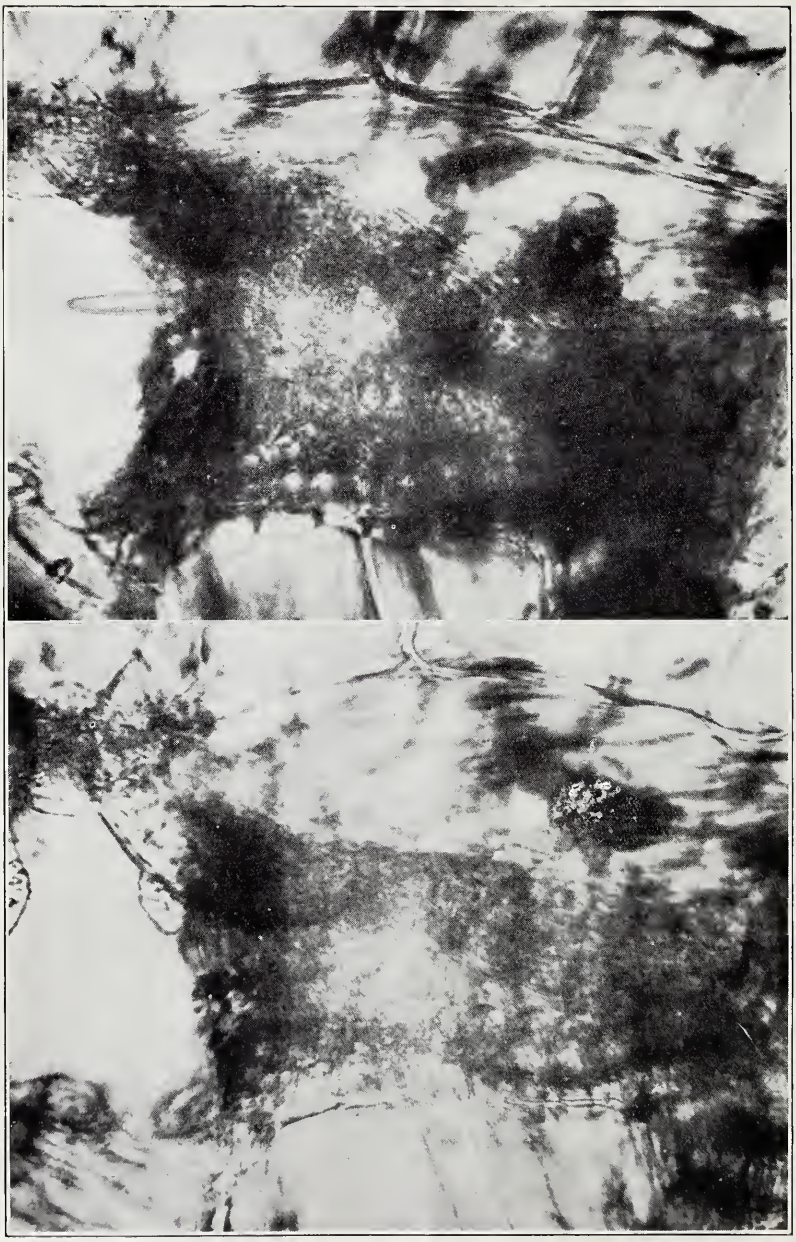

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PLATE X. UTRICULARIA CAPENSIS.

A REVISION OF DISPARAGO Gaertn.

By

Margaret R. Levyns, B.A., D.Sc. F.R.S.S.Af.

The genus Disparago was established by Gaertner in 1791 for a plant which he named *Disparago ericoides*. His figure makes it quite clear that the plant which he had in mind is one which is abundant in the eastern coastal region of the Cape Province. His description, however, in which the capitula are stated to be 2-flowered is somewhat unfortunate in that it is not strictly applicable to this plant. This eastern Disparago is unique in the genus in that all the capitula are 1-flowered, though this single flower may be either tubular or ligulate. Capitula of both types are always found massed together in one head, so the general effect is the same as in the western Disparagos where the majority of the capitula are 2-flowered, one flower tubular and the other ligulate. It is fortunate that Gaertner's figure leaves no doubt as to the plant he named *Disparago ericoides*, which is the nomenclatural type, for in 1767 the plant now known as *Disparago lasiocarpa* was described by Bergius as *Stoebe ericoides*. In his description Bergius states that the ovary is tomentose and the ligulate florets sterile. These characters belong to a purely western plant and not to *Disparago ericoides* Gaertn. Bergius' specimen is preserved in the Linnaean Collection and its identity is certain. The specific name *lasiocarpa* given by Cassini in 1825 must therefore supersede the older name, the use of which was not permissible when this plant was transferred from Stoebe to Disparago.

Disparago is a natural genus and at first sight appears to be one easily defined. A detailed study, however, has shown that this is not the case. The 2-flowered capitulum, which is always taken to be a good generic character, is not a constant feature of any one species. The case of *D. ericoides* Gaertn. where the capitula are all 1-flowered has been quoted above. In *D. lasiocarpa* Cass., *D. laxifolia* DC., *D. Kraussii* Sch. Bip. and *D. anomala* Schlecht. *ex* Levyns most of the capitula are 2-flowered but 1-flowered capitula with a tubular floret are present in addition. *D. lasiocarpa* has fewer 1-flowered capitula than the others in which such capitula occur frequently. 3-flowered capitula have been noted occasionally in *D. laxifolia* and *D. Kraussii*. This variability in the number of florets in the capitulum in the recognised species of this genus leads one to the

inevitable conclusion that the number of florets though in general a useful guide, is not of paramount importance.

That being so, support is given to Hutchinson's proposal (1) to extend the genus to include two species in which the florets vary from 3 to 8 in the capitulum. As Hutchinson points out, the character of the pappus in these two species is an important feature. Throughout Disparago whenever a pappus is present the feathering of the bristles never extends to the base as is the case in the related genus Amphiglossa.

The pappus, apart from the type of feathering has proved a most variable feature and although its use as a specific character is still of value, yet considerable caution must be observed in making use of it as a diagnostic feature. In *D. ericoides* both types of floret possess a pappus which in general is composed of five bristles. Towards the northern limit of its distribution, however, in Kentani and the South of Natal, the number is always greater than five and may be as high as thirteen. In general *D. laxifolia* has five bristles on its tubular florets and none on its ligulate florets. However, a careful dissection of several hundred capitula revealed the fact that in rare instances bristles varying from one to three in number may be present on the ligulate floret. These cases were mostly recorded from those capitula where three florets (two ligulate and one tubular) were present, and in every case only one of the ligulate florets had a pappus. This detailed search made it apparent that the pappus, normally suppressed, had the power of developing on rare occasions.

The species *D. Kraussii* has only been collected six times. Generally the pappus is absent from the ligulate florets as in *D. laxifolia*. However, in a specimen (Schlechter 2449) from Christina Bay, George, which in all other respects agrees with *D. Kraussii*, the ligulate florets have a few pappus bristles. In the writer's opinion this feature in view of its instability in related species cannot be stressed greatly, and Schlechter's specimen has therefore been placed in *D. Kraussii*.

Disparago anomala, a name given by Schlechter but never published, is exceptional in that the pappus is lacking in both types of floret. This species occurs frequently from the Cape Peninsula eastwards to Bredasdorp and several hundreds of specimens have been examined. In one specimen only (Levyns 3534 Bredasdorp) is there a pappus of five bristles in the tubular floret. This specimen is a single shoot which together with four normal shoots was collected from plants growing in one spot and assumed to be all *D. anomala*. It was only on careful dissection that this one shoot was found to be different from the rest. The presence of the pappus makes the plant approach *D. laxifolia* so

closely that it is difficult to separate it from that species. However, the habit is less lax than in the latter, the pappus bristles are less robust and the time of flowering is that of *D. anomala* not *D. laxifolia*, which flowers about three months earlier. If it be ceded that florets normally without a pappus have still the capacity for pappus production under certain circumstances, then this exceptional plant is best placed in *D. anomala*, and the case parallels that of Schlechter 2449 in *D. Kraussii*.

In connection with this phenomenon of sporadic pappus production in florets which have normally lost that capacity, it is interesting to recall that in *D. lasiocarpa* (the most stable species in floral characters of the western Disparagos) De Candolle separated off as a distinct species *D. seriphioides* a plant which differed from *D. lasiocarpa* merely in having five pappus bristles in the ligulate floret. This case has been discussed previously (**3**), and it was suggested that some of the numerous hairs from the ovary of the tubular floret had been mistaken for pappus bristles of the ligulate floret. In view of this recent discovery that the suppression of the pappus does not appear to be absolute in the genus, it is possible that Burchell 705 did have a pappus and is yet another instance of parallel behaviour in related species.

While dissecting large numbers of capitula in *D. laxifolia* in connection with the pappus, another feature was brought to light, namely, that whereas the majority of the florets have glabrous ovaries, yet now and then an odd one is formed with a dense covering of shaggy hairs on its ovary. It has always been assumed in the past that the presence or absence of hairs on the ovary is a good specific character in this genus and in a general sense it is still true. However, the occasional appearance of a hairy ovary among numerous glabrous ones indicates the need for caution when making use of such a character. It is of interest to note that in the allied genus Stoebe a similar variation in the ovary has been recorded. As the phenomenon appears to be of greater importance in that genus than here, the discussion on the subject will be postponed.

The species show a considerable range of variation in vegetative features. *D. lasiocarpa* and *D. anomala*, the two common species on the Cape Peninsula, were selected for special study. In both cases the majority of individuals examined fell into a single class with regard to length of internode and leaf size. However, as in previous genera studied (**2**, **4**), two other classes of plant occurred—(*a*) those in which the internodes were shorter than usual and the leaves smaller, and (*b*) those in which gigantism of all the parts was evident. Size in both cases bore no relation to habitat. Both these classes were much less frequent than the type, but their invariable presence indicates that these dwarf

and giant forms cannot be neglected in the study of a species. Mutants of this type have been a fruitful source of confusion in herbaria and must of necessity be so when indoor study is not supplemented by work in the field.

An interesting giant plant of *D. lasiocarpa* (Levyns 5091) was observed coming up from its underground stem after a veld fire. It was larger and coarser in all its parts than any other plant seen and its capitula were grouped in rather small heads towards the ends of the branches. These were not closely massed in rounded heads at the extreme ends of the branches as in typical plants of this species. In *D. rosea* and *D. Kolbei* which Hutchinson considers primitive species in the genus, this feature is a normal characteristic and it is interesting to find that this character may appear as an exception in a species where the massing of capitula is a prominent feature.

Acknowledgments.

An important part of this investigation was carried out at Kew, and I am indebted to the Director for permission to work in the herbarium and for the many facilities afforded me. My thanks are due to the directors of the herbaria at Berlin, Paris and Geneva for the loan of type specimens. I have had free access to specimens housed in the British Museum, Bolus Herbarium and the South African Museum, and I wish to record my appreciation of the courtesy of the directors of those institutions.

DISPARAGO Gaert. Fruct. ii. 463 t. 173 (1791).

Capitula 1-8 flowered, both ligulate and tubular florets present in the same capitulum or in the same head formed by the massing of capitula. *Involucral bracts* imbricate, in few rows, the inner scarious the outer more or less leafy. *Receptacle* naked. *Tubular florets* bisexual, regular, with or without a pappus, style branches truncate penicillate, the base of the style swollen and seated on a waxy disc. *Ligulate florets* female or sterile, with or without a pappus. *Achenes* beakless and sessile. *Pappus,* when present, of bristles plumose in the upper part and naked at the base, sometimes with a small rim or minute scales external to the bristles.

Small shrubs with ericoid leaves.

An endemic South African genus. Species 7.

KEY TO THE SPECIES.

A. Florets more than three in a capitulum.
  B^1 Leaves straight, adpressed; young shoots densely woolly .. .. 1. *Kolbei.*
  B^1B^1. Leaves spirally twisted, somewhat spreading; young shoots not densely woolly .. .. 2. *rosea.*

AA. Florets 1—3 in a capitulum.
  B^2. Capitula normally 1-flowered .. .. 3. *ericoides.*
  $B^2.B^2$. Many capitula in each head with 2 flowers.
    C. Ovary of tubular floret densely hairy .. .. 7. *lasiocarpa.*
    CC. Majority of florets in any head with a glabrous ovary.
      D. Pappus normally absent from both florets 6. *anomala.*
      DD. Pappus present at any rate in the tubular florets.
        E. Spreading habit; leaves laxly arranged 5. *laxifolia.*
        EE. Erect habit; leaves crowded .. .. 4. *Kraussii.*

1. DISPARAGO KOLBEI Hutch. Kew Bull. p. 511 (1932). *Amphiglossa Kolbei* Bolus, Trans. S.Af. Phil. Soc. XVIII, p. 394 (1907-1909).

A grey, erect, much branched shrub, about 20 cm. high. Young branches densely woolly. *Leaves* ericoid, 2—3 mm. long, adpressed, closely packed, densely tomentose above, less so below, somewhat glabrescent. *Capitula* two or three together at the apices of the branches, rarely solitary. *Tubular florets* hermaphrodite, 2—4, pink, ovary glabrous, pappus of about 12 bristles slightly joined at the base and cupped with a saucer-like annulus. *Ligulate florets* female, 1—3, ovary and pappus as in the tubular florets.

Flowering season. October.

LAINGSBURG: Top of the Witteberg, Compton 2689!

PRINCE ALBERT: Zwartberg Pass, Kolbe 1477! Schröter!

This species and the next are very closely related, their capitula being indistinguishable. *D. rosea* has been collected once at an altitude of 3.000 ft. *D. Kolbei* has been found in two localities, (*a*) Zwartberg Pass (no altitude given) and (*b*) on the top of the Witteberg near Matjesfontein, at an altitude of 5,000 ft. In the related genera Stoebe and Metalasia woolly forms within a species are often characteristic of high altitudes, and it is possible that in this case we are dealing with the same phenomenon. However, the two species have been retained here pending further collections and observations in the field.

2. DISPARAGO ROSEA Hutch. in Kew Bull. p. 511 (1932).

A much branched, leafy shrub up to 25 cm. high. *Leaves* spirally twisted, spreading, 2—3 mm. long, mucronate, woolly on the upper surface. *Capitula* solitary or clustered at the ends of the shoots. *Tubular*

florets hermaphrodite, 2—5, deep pink, ovary glabrous, pappus of about 12 bristles, slightly joined at the base, cupped by a shallow, saucer-like annulus. *Ligulate florets* female, 1—3, rose pink, irregularly toothed at the apex, ovary and pappus as in the tubular florets.

Flowering season. October.

Uniondale : Near Avontuur, Fourcade 1663 !

3. Disparago ericoides Gaert. Fruct. ii. p. 463, t. 173 (1791). Less. Syn. Comp. p. 363 (1832). DC. Prod. VI, p. 257 (1837). Harv. in Fl. Cap. iii, p. 278 (1864-1865).

A much branched, densely leafy shrub, sometimes reaching a height of 90 cm., but usually smaller. *Leaves* ericoid, 3—6 mm. in length, tipped with a bristle, patent or reflexed, usually spirally twisted, upper surface woolly. *Capitula* crowded, forming dense, globose, terminal heads, each capitulum normally with one floret which may be either tubular or ligulate, both types present in the same head. *Involucral bracts* scarious, acuminate, a little shorter than the florets. *Tubular florets* hermaphrodite, usually pink sometimes white, pappus of 5—13 bristles, about the same length as the corolla. *Ligulate florets* female or neuter, usually pink sometimes white, pappus of 5—13 bristles shorter than the corolla. *Achenes* in both types of floret glabrous.

Flowering season, chiefly from May to September, but the season does not appear to be well defined.

Stellenbosch : (Collector unknown), Sir Lowry's Pass ! Caledon : (Collector unknown) Palmiet River ! near Genadendal, Bolus 7394 ! Riversdale : Garcia's Pass, Leipoldt (16049 in Bolus Herbarium) ! Humansdorp : Humansdorp and van Staden's Rivierberge, Ecklon & Zeyher ! Humansdorp, Rogers 2946 ! Levyns 3788 ! Karreedouw, Galpin 9347 ! Uitenhage : Harvey 978 ! Zeyher ! Ecklon ! Between van Stadensberg and Bethelsdorp, Drège ! Port Elizabeth : Ecklon and Zeyher ! Tyson 2179 ! Paterson 1174 ! Zuurberg, Rennie 452 ! Albany : near Grahamstown, Tyson ! Cooper 21 ! MacOwan 1002 ! Bolus 1626 ! Levyns 3765 ! Rennie 327 ! Burchell 3530 ! Rogers 27367 ! Zwartwater Poort, Burchell 3432 ! Soutar's Post between Riebeek East and Grahamstown, Burchell 3503 ! Alexandria : Galpin ! Kowie, Tyson 13299 in Bolus Herbarium ! Somerset East : Bowker ! Boschberg, MacOwan 1002 ! Komgha : Kei Mouth, Flanagan 213 ! Kentani. Pegler 260! Natal : Murchison, J. M. Wood 3078 ! Umgumbe, J. M. Wood 12857 !

4. Disparago kraussii Sch.Bip. in Flora XXVII, p. 693 (1844) Harv. in Fl. Cap. III, p. 278 (1864-1865).

An erect shrub up to 40 cm. high. *Leaves* ericoid, closely packed, erect, spirally twisted, 5 mm. long or less, woolly on the upper surface. *Capitula* massed in globose or oblong heads, mostly 2-flowered, mixed with occasional 1-flowered capitula in which the single floret is tubular, rarely 3-flowered. *Florets* white. *Tubular floret* hermaphrodite, with a pappus of 5 bristles, and a glabrous ovary. *Ligulate floret* sterile, pappus variable, absent or consisting of 1—5 bristles.

Flowering season. April to June.

Riversdale : Plattebosch, Muir 5217 ! Albertinia, Muir 1975 ! 1978 ! George : Christina Bay, Schlechter 2449 ! Knysna : Keet 960 ! Humansdorp : Zitzikama, Krauss !

5. Disparago laxifolia DC. Prod. VI. p. 257 (1837). Harv. in Fl. Cap. III, p. 278 (1864-1865).

A small, spreading undershrub, 15 cm. high or less. *Branches* with a covering of wool when young, becoming more or less glabrous with age. *Leaves* ericoid, up to 6 mm. long, spreading, scattered, spirally twisted, with a short mucro when young, woolly on the upper surfaee. *Capitula* in rounded heads at the ends of the branches. *Florets* white. Heads composed mainly of 2-flowered capitula with a few 1-flowered capitula interspersed, the floret of the latter always tubular ; rarely with 3 flowers, one tubular and two ligulate. *Tubular floret* hermaphrodite, with a pappus of 5 bristles ; ovary usually glabrous but occasional hairy ovaries may be present in a head in which most of the ovaries are glabrous ; a delicate annulus of small scales may be present outside the pappus. *Ligulate floret* sterile, normally without a pappus, but occasionally with 1—3 typical bristles.

Flowering season. October to January.

Cape : Simon's Bay, C. Wright ! Red Hill, T. Salter 286/12 ! Levyns 5093 ! Stellenbosch : Sir Lowry's Pass, Drège ! Schlechter 7223 ! Caledon : near Grabouw, H. Bolus 5077 ! Houw Hoek, Schlechter 5447 ! Caledon, Ecklon in h. Dunant ! Palmiet River, Levyns 5358 !

6. Disparago anomala Schlechter ex Levyns. (A manuscript name used by Bolus and Wolley Dod in " A List of the Flowering Plants and Ferns of the Cape Peninsula," Trans. S.Af. Phil. Soc. XIV, pp. 207-373 (1904).)

Foliis spiraliter tortis ; capitulis glomeratis, 1—2-floris ; pappo nullo.

A much branched undershrub, rarely over 20 cm. high, usually less. *Leaves* ericoid, more or less spirally twisted, up to 6 mm. in length, woolly on the upper surface. *Heads* globose or oblong, composed of numerous capitula, the majority having two flowers, a few 1-flowered.

Florets white. *Tubular floret* hermaphrodite, without a pappus, very rarely with a weakly developed pappus of 5 bristles, ovary glabrous. *Achene* sometimes with a rim-like annulus outside the bristles. *Ligulate floret* sterile, without a pappus.

The type is Schlechter 10443 from Papies Vley.

Flowering season. January to April.

Cape : Smitswinkel Bay, Wolley Dod 766 ! Levyns 4935 ! South West of Simon's Town, Pillans 4919 ! Buffels Bay, Salter 2933 ! 280/15B Cape Flats, R. S. Adamson, 4256 in University of Cape Town herbarium ! Klipfontein Road, Salter 280/15 ! West of Faure, Salter 4326 ! Caledon! Onrust Rivier, Sehleehter 10393 ! Houw Hoek, Sehlechter 7412 ! Bredasdorp : Elim, Sehleehter 7679 ! Bredasdorp, S. J. Dix in S.A. Museum 41927 ! Galpin 10479 ! Levyns, 3523 ! 3534 ! 4871 ! Papies Vley, Sehleehter 10443 !

7. Disparago lasiocarpa Cass. in Diet, Sci. Nat. XXXIV. p. 42 (1825). DC. Prod. VI, p. 258 (1837). Harv. in Fl. Cap. III, p. 278 (1864-1865). *D. seriphioides* DC. Prod. VI. p. 257 (1837). *D. hoffmanniana* Sehlechter in Engler's Jahrb. XXVII p. 203 (1900). *Stoebe ericoides* Berg. Cap. p. 339 (1767). *Seriphium ericoides* Pers. Syn. ii, p. 500 (1807). *Wigandia disparaginoides* Less. Syn. Comp., p. 362 (1832).

A small densely leafy shrub up to 30 cm. high. *Branches* slightly woolly when young. *Leaves* erieoid, twisted, spreading, shortly mueronate, 6 mm. in length or less. *Capitula* grouped in heads whieh are usually terminal and globose, normally 2-flowered, rarely 1-flowered. *Florets* pink, the tubular darker than the ligulate, or rarely the ligulate floret white, the tubular purplish. *Tubular floret* hermaphrodite, with a pappus consisting of many bristles and the ovary densely eovered with white, crisped hairs. *Ligulate floret* sterile with a rudimentary, glabrous ovary.

Flowering season. November to Mareh.

Piquetberg : Edwards 14411 in Bolus Herbarium ! Tulbagh : Eeklon 385 ! 517 ! Pappe ! Cape : Flats near Salt River, Burchell 706 ! Cape Flats near Rondeboseh, Burchell 829 ! Rondeboseh, Drège ! Cape Flats, Eeklon 76 ! Wynberg, Roxburgh ! Hout Bay, Harvey 303 ! Raapenberg, Guthrie 755 ! Steenberg, Wolley Dod 746 ! Muizenberg, Bolus 3297 ! Chapman's Peak, Wolley Dod 2735 ! Kommetje, Moss 8834 ! Olifants Boseh, Levyns 5091 ! Koeberg, Pillans 6793 ! Stellenbosch : Sir Lowry's Pass, Drège ! Caledon : Steenbras, Moss and Rogers 1597 ! Houw Hoek, Bolus 3297 ! Sehleehter 7412 ! 7417 ! T. M. Salter 4055 !

Mossel River, Potts 1609 ! Hermanus, Gillett 658 ! Palmiet River, Levyns 2694 ! 3847 ! Genadendal, Burchell 7840 ! Bolus 7394 ! Schlechter 9801 ! Levyns 4847 ! BREDASDORP : Elim, Schlechter 9643 ! SWELLENDAM : Breede River, Burchell 7472 ! Hessaquas Kloof, Burchell 7529 ! RIVERSDALE : Schlechter 2177 !

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ALOE TENUIOR. Haw.

A REVISION OF THE SPECIES, WITH DESCRIPTIONS OF TWO NEW VARIETIES.

(With Plates XI-XII.)

By G. W. Reynolds.

It is recorded that *Aloe tenuior* was introduced into European gardens by Bowie about 1820, without locality; it was first described by Haworth in Phil. Magaz. Oct., 1825, p. 281.

The species as we know it in South Africa to-day, occurs from Bruintjes Hoogte (Somerset East Division), eastwards into Pondoland, and south or east of the first mountain ranges. It is found in 3 very distinct forms, viz. :—

(*a*) An evergreen scandent form, developing stems 1—2 yards in length, flowers yellow.

(*b*) A deciduous low bush form, with stems only 1—2 feet long, in patches 3—6 feet diam., the leaves falling in winter, flowers yellow.

(*c*) An evergreen scandent form, similar to (*a*), but with bright red flowers.

When one considers the localities cited by Berger, in the light of earlier published descriptions, there has been a doubt as to whether (*a*) or (*b*) is to be regarded the typical form. Since the type is described with yellow flowers (*c*) cannot be the typical. Some hold that (*a*) and (*b*) are the same thing, merely the result of climatic conditions and habitat, and that (*b*) would develop sarmentose stems were it growing among bushes, instead of as it does, in flat exposed positions, often in stony ground. In the writer's opinion this view is untenable, and he would refer botanists to certain plants in the Victoria East Division. Six miles north of Alice (on the Hog's Back road), a large field of the low bush form of the species is to be found, with stems bare, and no sign of leaves in early August, whereas 25 miles south of Alice (near Breakfast Vlei), the evergreen scandent form is found then in full bloom. In October-November the former is in young bud, when the latter is in seed; they can therefore hardly be regarded the same thing. In view of their close similarity in shape, size and structure of flowers, to determine which constitutes the typical form is not as simple as it might appear, but it

certainly seems that one of the principal distinguishing characters is the length of stem developed.

In Haworth's short original description (Philos. Magaz., Oct. 1825, p. 281) the species is described "with slender stem," while Roem. et Schult. (Syst. Veg. VII. 1829, p. 704) record "*caudice gracillimo,*" and mention that it is similar to *Aloe striatula* Haw., but with stems twice as slender. In Salm Dyck's concept, (Salm Monog. 1836-49, 25, fig. 3), the stem is described "6—8-*pedalis, vix crassitie digiti minores, teres, debilis, decumbens nisi suffultus.*" The 6—8-foot stems decumbent unless supported (by bushes) establishes that the species is essentially a climber. In the fourth publication (Kunth. Enum. pl. IV. 1843, 529), we read "*Caule gracillimo, erecto-decumbente,*" while Baker (Journ. Linn. Soc. XVIII. 1880, p. 169), merely gives "*caulis longe sarmentosus,*" but in Th. Dyer, Flora Capens. VI. p. 317, he clearly states "stem many yards long when fully developed, sarmentose." Berger's account (Das Pflanzenreich, Liliac-Asphod-Aloin. p. 258), states "*caules graciles, sarmentosi,* 8—10 *mm. diam.*"

From the above accounts, it is clearly established that in the typical form the stems are slender, sarmentose, 6—9 ft. long, scandent, or decumbent when not supported, and for these reasons, this form is regarded as being the typical species.

The writer has not had an opportunity of consulting any of the material quoted by Berger, but during the last 3 years he has made several journeys throughout the Eastern Province and Transkei, and, with the exception of Salem and Bathurst, he has repeatedly visited all localities cited by Berger, while he has also found the species in several other localities not hitherto recorded.

As a result of these observations, a revision of the species seems advisable, and in order conveniently to classify the varieties, the following revision is proposed.

Key to the Varieties.

A. Stems long, 1—3 met., sarmentose, scandent or erectly decumbent, terminating in a sub-dense rosette of leaves, leaves dull green, spreading, peduncle as long as the raceme :

1. Perianth yellow, 11—14 mm. .. .. .. 1. *Aloe tenuior.*
2. Perianth red, 12—20 mm. .. .. .. 2. var. *rubriflora.*

B. Stems short, 30—66 cm., not sarmentose, foliate for their greater length, leaves more glaucous, sub-erectly incurved, deciduous, peduncle twice the length of the raceme : perianth yellow, 11—13 mm. .. .. .. 3. var *decidua.*

The typical form is found in large numbers in the southern portion of the Victoria East Division : it is abundant in the neighbourhood of Breakfast Vlei, eastwards to the Keiskama River, and on hills between Line Drift and Peddie. It is found mostly supported by bushes, the stems developing a length of 1—2 metres and rarely foliate below the terminal sub-lax rosette. When growing away from bushes, the stems are erectly decumbent and slightly shorter. At these localities the racemes are usually 8—15 cm. long, the peduncle slightly longer and occasionally with 1—2 short branches. It is an evergreen, with yellow flowers in August-September.

The Kei Hills form is found on steep slopes, and differs a little from that at Breakfast Vlei ; the peduncle is longer, very rarely with one short branch, the racemes are slightly laxer and up to 20 cm. in length, while it flowers usually in October. It is also found nearer the Coast skirting forests in the Kentani District and further inland near Kei-Bolo bridge. (Plants in Division of Botany Garden, Pretoria : No. 563.10.35 *ex* Breakfast Vlei, and 585.10.35 *ex* Kei Hills.)

Description.—Roots tuberous. *Stems* slender, sarmentose, frequently branched, 1—3 met. long, 10—15 mm. diam., rarely foliate below the terminal sub-lax rosette, the internodes 5—15 mm., the sheaths obscurely green-lineate, not auriculate. *Leaves* rosulate, erectly spreading, linear-lanceolate, slightly fleshy, smooth, immaculate, rather glaucous, sub-canaliculate above, convex below, 10—15 cm. long, 10—15 mm. broad; the margins with exceedingly narrow white cartilaginous edge armed with minute teeth up to ½mm. long, 1—2mm. distant, larger near base, gradually smaller upwards. *Peduncle* 10—20 cm. long, 3—5 mm. diam., simple, sometimes with 1—2 short branches, flattened low down, semi-terete above, nude or with 1—4 small scattered sterile bracts, the bracts thin, scarious, acuminate, up to 6 mm. long, 5—7 nerved. *Raceme* 8—16 cm. long, 4 cm. diam., cylindric, slightly acuminate, subdense, the buds slightly denser and greener, sub-erect or spreading, the open flowers yellow, horizontally disposed or spreading slightly downwards, the lowest up to 5—10 mm. distant. *Bracts* narrowly linear-deltoid, acuminate, slightly longer than their pedicels, thin, scarious. *Pedicels* very slender, the lowest 3—5 mm. long, gradually shorter upwards. *Perianth* tubulose or sub-campanulate-cylindric, 11—14 mm. long, slightly stipitate at base, yellow. *Outer segments* connate to beyond the middle, obscurely 3-green-nerved, the free portion ovate with sub-acute slightly spreading apices. *Inner segments* free, not cohering dorsally to the outer, slightly longer and broader than the outer, with 3 congested nerves forming a slight keel pale yellow for its greater length, turning orange at apex, the margins thin, white, the apices sometimes brown tipped, more obtuse and more spreading

than the outer. *Filaments* sub-filiform, flattened, the 3 inner narrower and lengthening in advance of the 3 outer, pale lemon in colour. *Anthers* yellow, exserted 4—6 mm. *Style* filiform, slightly yellower than the filaments. *Stigma* exserted 4—6 mm., and remaining exserted after pollination. *Ovary* 2·5—3 mm. long, 1·5 mm. diam., finely 6-grooved, lemon in colour. *Capsule* 13 mm. long, 7 mm. diam.

2. Var. **rubriflora** Reynolds. Varietas nova et distincta, a typo floribus rubris facile distinguitur.

Hab : Pondoland ; steep slopes near the foot of Mlengana, 33 miles east of Umtata on the road to Port St. Johns, fl. 19 January, 1936, Reynolds 1750 (type) in National Herbarium, Pretoria ; Mlengana, February, 1896, Bolus 10337 in Bolus Herbarium. Transkei *:* Valley of the Qora River between Willowvale and Kentani, fl. 22 January, 1936, Reynolds 1753 in National Herbarium, Pretoria ; Reynolds 137 fl. April, 1934, in Bolus Herbarium. (Plate XI).

This very distinct and attractive variety appears to be confined in its distribution to the Coastal belt of the Transkei and Pondoland. It differs little from the typical form in general habit of growth, but is immediately distinguished by its red perianth, with the yellow inner segment apices giving the red flowers a yellow tipped appearance. Plants occur mostly on steep slopes, frequently among bushes with the scandent stems developing a length of 6—9 feet ; when growing in exposed positions, the stems rarely exceed 3—5 feet in length and form untidy bushes. The red perianth varies little in colour, but in weak starved forms flowers are found only 10 mm. long, while in luxuriant plants growing in damper, more protected positions, the flowers sometimes reach 20 mm. in length; the most frequent is 14—15 mm. The inflorescence is usually simple, very rarely with a short branch, and up to 50 cm. long, the raceme reaching 20 cm. in length. The flowering period is January—March.

In some respects the var. *rubriflora* resembles *A. ciliaris* Haw. var. *Tidmarshii* Schonl. from Stones Hill, Grahamstown, but in the latter the sheathing leaf base is lightly auricled and minutely toothed, while the flowers are longer and slightly more campanulate, with the genitals scarcely exserted. In the var. *rubriflora* the sheaths are neither auriculate nor dentate, the flowers are usually only 15 mm. in length, with the genitals very clearly exserted 5—6 mm.

Plants are at present growing in the garden of the Division of Botany, Pretoria, under Nos. 598.10.35 and 935.1.36, and in the National Botanic Gardens, Kirstenbosch Nos. 837/34 and 3056/34.

Description.—Closely resembling the typical in general habit of growth stems, rosettes, leaves, pedicels and bracts, but differing with longer peduncle and racemes, longer flowers, red perianth, shorter

Fig. 1.

Fig. 2.

Plate XI. *Aloe tenuior* Haw., var. *rubriflora* Reynolds.

Fig. 1. Portion of a plant, flowering 19 Jan., 1936, near the foot of Mlengana, 33 miles east of Umtata, Pondoland.

Fig. 2. Flowers 1/1, from a plant flowering 22 Jan., 1936, at Qora River, between Willowvale and Kentani, Transkei.

Note —Owing to the use of Panchromatic Film, the red flowers in Fig. 1 appear paler.

Fig. 2.

Plate XII. Fig. 1.

Fig. 1. *Aloe tenuior* Haw. var. *decidua* Reynolds. Plant flowering 29 Jan., 1936, one mile south of Fort Beaufort, C.P.

Fig. 2. Upper row: *A. tenuior* Haw. var. *decidua*, Reynolds. Flowers 1/1, from the bud to the fruit stage, from a plant flowering 27 Jan., 1936, six miles north of Alice, Victoria East Div., C.P.
Lower row: *A. tenuior* Haw., the typical form, flowers 1/1 from the bud to the post-pollination stage, from a plant flowering 12 Oct., 1935, Kei Hills near Eagle Siding, Butterworth Dist., Transkei.

segments and colour of inner segment keel. *Perianth* red, 10—20 mm. long. *Outer segments* connate into a tube for four-fifths their length, obscurely 3-nerved, the margins paler, the apices sub-acute slightly spreading. *Inner segments* free to base, yellow, with thinner paler margins, the keel pale orange.

3. Var. **decidua** Reynolds. Varietas nova, a typo caulis foliosis, brevibus, 30—60 cm. longis, vix scandentibus, foliis deciduis, glaucioribus, arcuato-erectis, pedunculo racemo dupliore, differt.

Hab : Cape Province ; Victoria East Division, 6 miles north of Alice, fl. 27th January, 1936, Reynolds 1760 (type) in National Herbarium and Bolus Herbarium ; Fort Beaufort Division, 1 mile south of Fort Beaufort, fl. 29th January, 1936, Reynolds 1762 in National Herbarium and Bolus Herbarium ; Stockenstroom Division near Seymour, fl. 28th January, 1936, Reynolds 1761, in National Herbarium and Bolus Herbarium ; Somerset East Division, 4 miles north of Cookhouse, fl. January, 1934, Reynolds 428 in Bolus Herbarium. (Plate XII).

This is the most plentiful and most widely distributed variety varying a little in different localities. It differs from the typical principally with stems not sarmentose, only 30—60 cm. in length, and with the leaves drying and falling in winter. Usually new shoots appear from the base each Spring, the stems foliate for their greater length ; sometimes shoots appear from the apex of old stems, in which case only the new growth portion of the stem is foliate. The leaves are more arcuate erect, sometimes incurved, and more glaucous, while the peduncle is usually twice the length of the raceme ; it differs little from the typical in shape, size and structural characters of the flowers, and flowers mostly in January—February. At the Alice locality, patches are found 1—2 metres in diameter ; the plants at Fort Beaufort are a slightly more robust form, while those near Cookhouse, Somerset East, Bruintjes Hoogte, Middleton, Sheldon, in the Fish River Valley, Botha's Ridge, and elsewhere in that region are weak forms, rarely exceeding $\frac{1}{2}$ metre in diameter.

Description.—A low bushy herb in patches 1—2 met. diameter, with tuberous roots. *Stems* 30—60 cm. in length, not sarmentose, not scandent, foliate for their greater length, capitate with a sub-lax rosette of leaves, the internodes 12—25 mm., the sheaths obscurely green-striatulate, not basally auriculate. *Leaves* linear lanceolate, up to 18 cm. long and 22 mm. broad, more sub-erect or slightly incurved, more glaucous. *Inflorescence* simple, rarely with one short branch, up to 50 cm. in length, the peduncle twice the length of the raceme ; otherwise in flowers closely resembling the typical. (Plants No. 562.10.35 *ex* Alice in Division of Botany Garden, Pretoria, and 982/34 *ex* Seymour in National Botanic Gardens, Kirstenbosch.)

Note.—Berger (Das Pflan. p. 258) records the var. *glaucescens* A. Zahlb. from the Kei River, Transkei, Krook 780, fl. January, "*floribus aurantiacis, antheris rubris,*" and adds "*vix satis a typo recedit.*" Plants in the Kei Hills near Eagle Siding, and further inland near Kei-Bolo bridge, bear flowers more yellow than orange-yellow, with the anthers yellow-orange rather than reddish. From the writer's observations at these localities, he is of opinion that the var. *glaucescens* should be dropped, and these plants referred to typical *A. tenuior.*

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A REVISION OF ALOE TRANSVAALENSIS, O. KUNTZE, TOGETHER WITH DESCRIPTIONS OF THREE NEW ALOES FROM THE TRANSVAAL, ONE FROM NATAL, AND A NEW LEPTALOE FROM ZULULAND.

(With Plates XIII—XVIII.)

By G. W. Reynolds.

It has been presumed that the *Aloe* which flowers in February—March on hills at Pretoria, belongs to the species *A. transvaalensis* O. Kuntze, but any botanist who has examined flowering specimens at the Fountains and elsewhere near Pretoria, must have noticed the tremendous variation which occurs in branching, length of pedicels and bracts, and shape, size and colour of flowers. As to which of these represents the typical form has remained unknown. Kuntze's original description states, *inter alia*,[1] "*folia loriformia . . . haud acuminata*", but it is extremely doubtful whether plants can be found at Pretoria to-day with leaves "strap shaped and not at all acuminate." The inflorescence is described about 1 met. high, the flowers brick coloured, while in Berger's account,[2] the bracts are described 15 mm. long, the pedicels 20 mm.

Unfortunately there is no type material preserved in South Africa, nor any authentic material in the sense of specimens compared with the type, but owing to the great kindness of Dr. H. G. Schweickerdt at Kew, in arranging with the New York Botanical Garden to send Kuntze's type on loan to the Principal Botanist, Pretoria, I have fortunately been able to examine this material. There is one sheet, the material consisting of one small leaf and an incomplete inflorescence. The leaf is 15 cm. long, 4·5 cm. broad at base, lanceolate-attenuate, the marginal teeth 5 mm. long 10 mm. distant,—certainly not "*loriformia haud acuminata*" as described. The inflorescence is about 60 cm. long, with

[1] *Vide* Rev. gen. III (1898) 314.
[2] Engler: Das Pflanzenreich, Liliac.- Asphodel.- Aloin. 1908, p. 211.

five short branches without flowers, but in a capsule on the sheet there are six dried flowers 30 mm. long, from which it is impossible to gauge the shape and diameter of the basal swelling. There is a note " Pretoria, Transvaal, 17/2/94." From this material it is evident that a weak form of the species was described, and that the type is not characteristic of the most frequent form found at Pretoria. It is hardly likely that Kuntze would have described a plant from near Pienaars River (34 miles North of Pretoria), where *A. transvaalensis* and another species grow socially, cross freely, and produce a bewildering variety of intermediate forms.

With a view to reaching some finality, it seems advisable that the description of this species should be amplified to include that form which is most frequent and characteristic of the species, not only at Pretoria, but elsewhere in the Transvaal. From observations at the Fountains, Pretoria, during February-March 1935-1936 the writer would propose the following amplification as describing the most frequent form, and the one considered to be typical of the species.

Aloe transvaalensis, O. Kuntze. Acaulescent, solitary, or in small groups. *Leaves* 12—16, densely rosulate, lanceolate-attenuate, rather fleshy, usually arcuate-suberect in lower half, spreading to slightly recurved above, up to 20—25 cm. long, 6—7 cm. broad at base ; upper surface flat low down, gradually slightly canaliculate upwards, dull somewhat milky-green, with numerous dull white oval spots more or less confluent and arranged into a series of interrupted undulating transverse bands ; lower surface convex, paler green, obscurely lineate, with fewer duller white spots arranged in more obscure bands ; the margins narrowly sinuate-dentate, the teeth deltoid, pungent, light brown, 3—4 mm. long, 10—15 mm. distant, slightly more crowded near base, more distant upwards, the interspaces whiter and less horny below, more horny towards apex. *Inflorescence* a branched panicle, 1—1·5 met. high, branched above the middle with 5—8 arcuate erect or sub-erect branches, the lowest sometimes with 1—2 branchlets and subtended at base by subscarious attenuate many nerved bracts up to 5—6 cm. long. *Peduncle* semi-terete, brown, covered with a greyish powdery substance. *Racemes* cylindric, slightly acuminate, the terminal up to 30 cm. long, 8—9 cm. diam. rather laxly about 36 flowered, the lateral slightly shorter, fewer flowered, and lower than the terminal ; the buds rather lax, with dull whitish stripes, the open flowers cernuous or subpendulous, ranging from flesh-pink to light coral-red in colour. *Pedicels* the lowest of the terminal raceme 10—15 mm. long. *Bracts* narrowly lanceolate-acuminate, thin, scarious, many nerved, about half as long

Fig. 1.

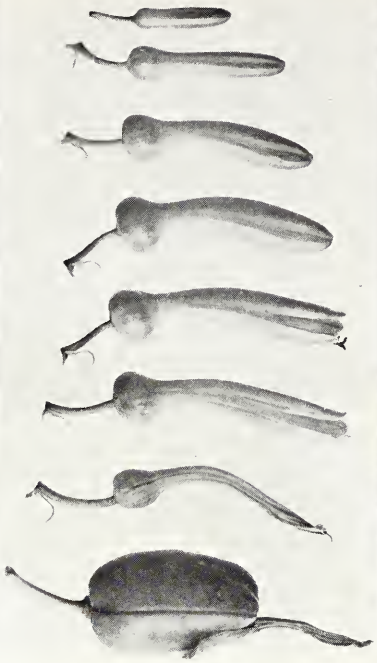

Fig. 2.

Fig. 3.

Plate XIII. *Aloe transvaalensis*, O. Kuntze.

Fig. 1. Flowering plant photographed at the Fountains, Pretoria, on 11 March, 1936, typical of the species.
Fig. 2. Flowers natural size, from the bud to post-pollination stage; the fruit also natural size.
Fig. 3. A group, photographed at the Fountains, Pretoria, 11 March, 1936.

Fig. 2.

Fig. 1.

Plate XIV. *Aloe ammophila*, Reynolds.

Fig. 1. Plant from 3 miles south of Pietersburg, North Transvaal, flowering in Johannesburg, 14th March, 1936.
Note: In the wild state this species suckers freely, soon forming dense groups.

Fig. 2. Flowers natural size, from the bud to post-pollination stage.

as the pedicels. *Perianth* flesh-pink, 36 mm. long, with sub-globose basal swelling 9—10 mm. diam. constricted above the ovary to 5 mm. thence slightly decurved and enlarging towards the throat, with open mouth. *Outer segments* free for 10 mm. from apex, with 1 mm. broad white marginal border, about 5—7-nerved, the nerves confluent at a somewhat brownish-green apex, the apices sub-acute, slightly spreading. *Inner segments* dorsally adnate to the outer for their greater length, with white marginal border twice as broad as the outer, and with more obtuse more spreading apices, very obscurely about 7-nerved, the nerves somewhat pale brownish-green at apex. *Filaments* very pale lemon, flattened, the 3 inner narrower and lengthening in advance of the 3 outer. *Anthers* the 3 inner and 3 outer in turn exserted 2—4 mm. *Stigma* at length exserted 2—4 mm. *Ovary* 7 mm. long, 3 mm. diam. slightly tapering into the style, finely 6-grooved, green. *Capsule* oblong, 28 mm. long, 16 mm. diam. at middle, 6-grooved, green.

Hab : Transvaal, at the Fountains, Pretoria, flowering 11th March 1936, Reynolds 1797 (typical form) in National Herbarium, Pretoria. Plants 1165.3.36 in Garden of Botanical Section, Division of Plant Industry, Pretoria, and 536/34 in National Botanic Gardens, Kirstenbosch. (Plate XIII.)

This species is found in the Pretoria, Johannesburg, Heidelberg, Standerton, Rustenburg, Marico and other Districts in the Transvaal, while what appears to be a form of this species occurs as far west as the Khomas Mountains in South West Africa. Its habitat is chiefly rocky slopes, often at the foot of kopjes, and frequently in between bushes, while it appears to prefer a westerly aspect. When found in sandy flats, it often grows socially with *A. ammophila* Reynolds, with which species it crosses freely, producing a variety of intermediate forms. *A. transvaalensis* is variable in length, shape and colour of flowers, also in the relative length of bract to pedicel. In the typical form, the perianth is flesh-pink, but forms occur with colours ranging from orange to red. Usually the lowest pedicels of the terminal raceme are twice the length of the bracts, but forms are found with bracts as long as the pedicels. The racemes are characterised by the buds being greyish striped, sub-erectly spreading, rather lax, and not densely congested. The leaves are usually of a dull, somewhat milky-green colour, the upper surface always with spots more or less confluent and arranged into a series of transverse bands, the lower surface more obscurely spotted, with the bands less defined. The species flowers in its various stations from January to March.

It is perhaps advisable to record that the Principal Botanist, Pretoria, has despatched to Herb. Kew, and to the New York Botanic Gardens,

specimens from the Fountains, Pretoria, (Reynolds 1799) as representing the form typieal of the species.

Aloe ammophila, Reynolds, species nova in seetione *Saponariarum*, *A. transvaalensi* O. Kuntze affinis. *Herba* sueculenta, acaulis, sobolifera mox eaespitosa. *Folia* 10—14, dense rosulata, laneeolato-attenuata, carnosa, usque ad 22 em. longa, 5—6 cm. lata, supra basin versus planiuscula, sensim leviter canaliculata, maeulis oblongis albis saepe confluentibus et paullo transverse fasciatim seriatis ; subtus convexa, pallide glaueoviridia, maculis albis oblongis irregulariter transverse seriatis pallidioribus fasciata, interdum obscure maeulata vel immaculata, marginibus dentibus deltoideis pungentibus brunneis 4—5 mm. longis, 8—12 mm. distantibus. *Inflorescentia* saepe 66 cm. alta, ramis 5—6, rami arcuatoerecti. *Pedunculus* basin versus leviter complanatus, circiter 14 mm. diam. *Racemi* eylindriei leviter acuminati, circiter 20—25 em. longi, 7 cm. lati, gemmis congestis, floribus laxioribus 15—30 mm. distantibus. *Pedicelli* 15 mm. longi. *Bracteae* pedicellos aequantes, deltoideo-acuminatae, subseariosae, eirciter 12-nervatae. *Perigonium* rubrum, 30—33 mm. longum, basi subgloboso-inflatum, (9—10 mm. diam.) supra ovarium eonstrietum, (5—6 mm.) deinde decurvatum et faucem versus ampliatum. *Segmenta exteriora* per 10—11 mm. libera, ad margines albida, apice subacuta paullum patula, obseure 5-nervis ; interiora latiora, obtusiora, marginibus albis duplo latioribus. *Filamenta* eomplanata. *Genitalia* 3—4 mm. exserta. *Ovarium* 8 mm. longum, 3·5 mm. diam., in stylum acuminatum.

Hab. : Transvaal, Pietersburg Dist., sandy flats 3 miles south of Pietersburg on the road to Chunes Poort, cultivated plants fl. 14th March 1936 in Johannesburg, Reynolds 1345 (type) in National Herbarium, Pretoria ; Plants 1224/35 in National Botanie Gardens, Kirstenbosch. (Plate XIV.)

As its name implies, *A. ammophila* is a sand loving species ; it occurs in considerable quantities in the more sandy parts of the central and Northern Transvaal, especially near Pietersburg, Bandolier Kop, Louis Trichardt, and beyond the Zoutpansberg towards Messina. It is also found in the Springbok Flats east of Warmbaths, Naboomspruit, Potgietersrust, and north-eastwards towards Malips Drift. It suckers freely, soon forms dense groups, and is often found in dense colonies of several hundred plants. *A. ammophila* is elosely allied to *A. transvaalensis* O. Kuntze, but the latter is a larger plant, with taller inflorescence, longer narrower flesh-pink flowers, with the bracts half as long as the pedieels, and with the buds not densely eongested at apex of racemes. In *A. ammophila* the inflorescence is usually only 2 feet high

with the terminal raceme only slightly higher than the lateral and forming a somewhat broadly corymbose paniele. The species is variable in branching, shape, size and colour of flowers, but is usually recognised by its somewhat milky-green leaves, the low inflorescence, the bracts as long as the pedicels, the coral-red flowers, and the greenish buds congested at apex of the acuminate racemes.

Description.—Herb succulent, acaulescent, freely suckering and forming dense groups. *Leaves* 10—14, densely rosulate, lanceolate-attenuate, up to 22 em. long, 5—6 cm. broad, upper surfaec dull green, flat near base, slightly canaliculate upwards, with numerous oval white spots more or less confluent and arranged into a series of irregular undulating transverse bands ; lower surface convex, obscurely lineate, immaeulate or sometimes clearly or obscurely spotted in transverse bands ; margins sinuate-dentate, with deltoid pungent light brown teeth 4—5 mm. long, 8—12 mm. distant, smaller and more crowded near apex, the interspaces rounded. *Inflorescence* usually about 66 cm. high, divaricately branched from the middle with 5—7 arcuate erect branches, the lowest sometimes with 1—2 branchlets, and subtended at base by rather fleshy attenuate bracts 5—6 cm. long, 15—20 mm. broad, the bracts many-nerved, the lateral racemes more or less as long and high as the terminal, forming a rather corymbose panicle. *Peduncle* slightly flattened and about 14 mm. diam. low down, more terete upwards, brown, covered with a greyish powdery substance. *Racemes* cylindric, slightly acuminate, about 20—25 cm. long, 7 cm. diam., sublaxly about 30-flowered, the buds slightly denser, greenish, gradually laxer downwards with the lowest flowers coral-red, 15—30 mm. distant *Pedicels* up to 15 mm. long, slightly longer in the fruit. *Bracts* deltoid-aeuminate, spreading and recurved, thin subscarious many-nerved, as long as the pedicels or slightly longer. *Perianth* coral red, 30—33 mm. long, with a subglobose basal swelling 9—10 mm. diam., constricted above the ovary to 5—6 mm. diam., thence decurved and enlarging towards the throat, slightly compressed laterally, the mouth open. *Outer segments* free for 10—11 mm., with 1 mm. wide white marginal border and sub-acute slightly spreading apices, obscurely 5-nerved, the nerves confluent at apex. *Inner segments* free, but dorsally adnate to the outer for their greater length, broader and with more obtuse more spreading apices than the outer, the white marginal border twice as broad. *Filaments* flattened, the three inner narrower and lengthening in advance of the three outer. *Anthers* the 3 inner and the 3 outer in turn exserted 3—4 mm. *Stigma* at length exserted 2—4 mm., and remaining exserted after pollination. *Ovary* 8 mm. long, 3·5 mm. diam. slightly tapering into the style, finely 6-grooved, green.

Aloe Vogtsii, Reynolds, species nova et pulcherrima in sectione *Saponariarum*, *A. petrophila* Pillans affinis, sed racemis laxioribus longioribusque differt. *Herba* succulenta, caulibus brevibus, vel usque ad 20 cm. longis. *Folia* 16—20, dense rosulata, lanceolato-attenuata, erecto-patentia, 20—25 cm. longa, basi 5—6 cm. lata; supra viridia concavia albomaculata, subtus convexa, maculis minutissimis, ad margines dentata, dentibus deltoideis, corneis deflexis brunneis 3 mm. longis 10—15 mm. distantibus. *Inflorescentia* circiter 66 cm. alta, medio circiter 7-ramosa, rami arcuato-erecti. *Pedunculus* semi-teres, circiter 13 mm. diam. *Racemi* breviter cylindrici, leviter acuminati, terminali usque ad 20 cm. longi, 8 cm. lati. *Bracteae* 10—15 mm. longae, ovato-acuminatae, circiter 9-nervatae. *Perigonium* coccineum, 34 mm. longum, basi subgloboso-inflatum, (9 mm. diam.), supra ovarium constrictum (5 mm.) deinde decurvatum et faucem versus ampliatum. *Segmenta exteriora* per 9 mm. libera. marginibus pallidioribus, apice subacuta, paullum patula; interiora obtusiora, latiora. *Filamenta* complanata. *Genitalia* vix vel brevissime exserta. *Ovarium* 8 mm. longum. 3 mm. diam.

Hab.: N. Transvaal, Zoutpansberg Dist. at Franzhoek, 10 miles north-east of Louis Trichardt, cultivated plant fl. 22nd March, 1936, in Johannesburg, Reynolds 1488 (type) in National Herbarium, Pretoria and Bolus Herbarium, Kirstenbosch. Plant 376.7.35 in garden of the Botanical Section, Division of Plant Industry, Pretoria. (Plate XV.)

This very distinctive new *Aloe* was discovered by Mr. Louis R. Vogts on the farm "Franzhoek," about 10 miles north-east of Louis Trichardt, and is named after the collector, who, apart from being an enthusiastic collector and keen student of the genus, has also contributed much material to the Herbarium and Garden of the Division of Plant Industry, Pretoria. Mr. Vogts has also found the species at Devil's Gully, and on rocky slopes further east above Pisanghoek, while the writer has collected it near "Schyffontein," about 6 miles north of Louis Trichardt. These localities are more or less along the top, or high up on rocky slopes of the Zoutpansberg, in the mist belt, and at an approximate elevation of 4,700 ft. This species does not sucker freely and form dense groups; although groups of 6—8 plants are sometimes seen, 2—4 seems to be most frequent. The narrowly elliptic double spots, somewhat resembling an elongated "H" in shape, on the leaf upper surface suggest an affinity with *A. petrophila* Pillans, which occurs in that neighbourhood on rock faces at Wylies Poort, but the latter has much smaller shorter capitate racemes, and very different flowers.[3]

[3] No figures accompany the Author's original description in *S.A. Gardening*, Sept. 1933, p. 213; it is however illustrated in *Flowering Plants of South Africa*, Part 56, October 1934, Plate 555.

FIG. 1.

FIG. 2.

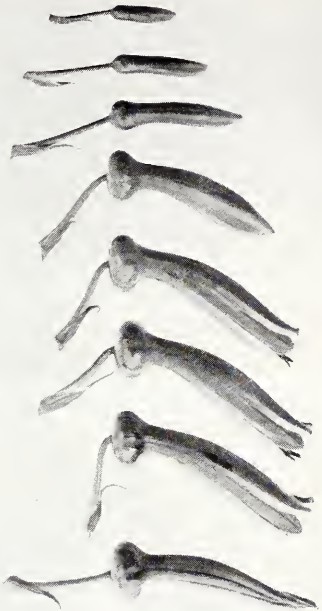

FIG. 3.

PLATE XV. *Aloe Vogtsii*, Reynolds.

FIG. 1. Flowering plant, collected by Mr. L. R. Vogts in the Zoutpansberg, 10 miles north-east of Louis Trichardt, flowering 22 March, 1936, in Johannesburg.

FIG. 2. Raceme, one quarter natural size.

FIG. 3. Flowers 1/1, from the bud to the post-pollination stage.

Fig. 1.

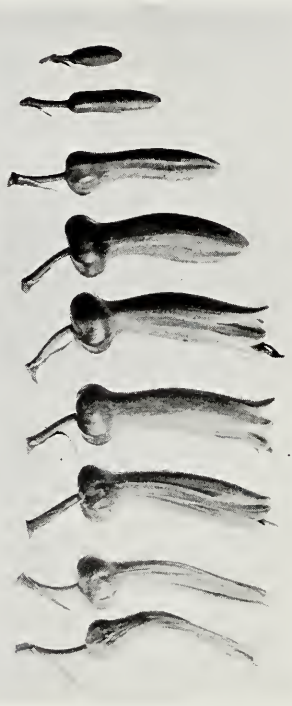

Fig. 2.

Plate XVI. *Aloe komatiensis*, Reynolds.

Fig. 1. Plant flowering 24 March, 1936 in the author's garden in Johannesburg, height 6 feet ; collected by Mr. C. Foster near Komatipoort, East Transvaal, alt. 650 feet.

Fig. 2. Flowers 1/1 from the bud to post-pollination stage.

A. Vogtsii does not appear to be closely allied to any other species in the section *Saponariae*, and is characterised by its peculiar leaf spotting and the set of the pedicels. The lower leaf surface is copiously spotted with minute green spots, with dull whitish broken wavy transverse bands, which seems to be a character peculiar to this species. From the accompanying illustration of a raceme, it will be noticed that the youngest pedicels and buds are sub-oblique, lower the pedicels are horizontal with the buds slightly declinate, while the lowest pedicels are sub-erectly spreading, with the flowers cernuous to pendulous.

At the Franzhoek locality, Mr. Vogts has collected a cross of *A. Vogtsii* with *A. Vossii*, Reynolds (section *Leptoaloe*), and another with the Zoutpansberg form of *A. arborescens*, Mill. With its dark sap-green leaves (cress green R.C.S.), scarlet flowers, and flowering in March before the frosts, this handsome species is one well worth cultivating.

Description.—Herb succulent, with stem short or up to 20 cm. long. *Leaves* 16—20, densely rosulate, 20—25 cm. long, 5—6 cm. broad, lanceolate-attenuate, erectly spreading, terminating with a short pungent horny spine; upper surface cress green, slightly concave, obscurely lineate, with numerous white spots, scattered or more or less arranged in a series of wavy interrupted transverse bands, the narrowly elliptic double spots somewhat "H" shaped; lower surface convex, duller green, with numerous deeper green minute spots, with obscure rather wavy irregular transverse dull whitish bands, and with a few short pale brown teeth in the median line near apex; the margins armed with deltoid pungent horny pale brown teeth, the teeth slightly deflexed, about 3 mm. long and 10—15 mm. distant, more isolated and with rounded white interspaces near base, browner and more sinuate-dentate upwards. *Inflorescence* about 66 cm. high, branched from about the middle, with about 7 arcuate-erect branches, the 1—3 lowest with 2—3 branchlets and subtended at base by subscarious acuminate bracts about 5 cm. long, 15 mm. broad, the bracts many-nerved, armed with a few short brown marginal teeth in upper third, the apex pungent. *Peduncle* semi-terete, about 13 mm. diam., brown, lightly covered with a greyish powdery substance. *Racemes* broadly cylindric, slightly acuminate, sub-laxly 30—40 flowered, the terminal slightly higher than the lateral, about 20 cm. long, 8 cm. broad, the lateral shorter and fewer flowered, the youngest buds greenish tipped, obliquely spreading, older buds more horizontally disposed with the open scarlet flowers cernuous to sub-pendulous. *Bracts* 10—15 mm. long, ovate-acuminate, thin sub-scarious, about 9-nerved, amplexicaul at base, spreading to recurved above. *Pedicels* up to 18 mm. long in the terminal raceme, slightly shorter in the lateral. *Perianth* scarlet, paler at mouth, 34 mm. long, sub-glo-

bosely inflated at base (9 mm. diam.), constricted above the ovary to 5 mm., thence decurved and enlarging towards the throat, slightly compressed laterally. *Outer segments* free for 9 mm. from apex, with pale yellowish 1 mm. wide marginal border, and with sub-acute very slightly spreading apices. *Inner segments* with slightly broader dull pale yellowish border, and with more obtuse more spreading apices. *Filaments* pale lemon, much flattened, the 3 inner narrower and lengthening in advance of the 3 outer. *Anthers* scarcely exserted. *Style* slightly yellower than the filaments, with the stigma scarcely exserted. *Ovary* green, 8 mm. long, 3 mm. diam. at base, slightly tapering into the style, finely 6-grooved. The leaf sap dries purple.

Aloe komatiensis, Reynolds, species nova in sectione *Saponariarum*, *A. zebrinae* Bak. affinis, sed habitu florum et succo foliorum purpurascente distinguitur. *Herba* succulenta, caulibus 10—20 cm. longis, nec sobolifera, (? an semper). *Folia* 16—24, dense rosulata, lanceolato-attenuata, recurvula, carnosa, usque ad 40 cm. longa, 9—12 cm. lata, supra planiuscula, apicem versus subcanaliculata, obscure viridia, maculis oblongis albidis numerosis transverse irregulariter fasciatim seriatis picta ; subtus convexa, obscure lineata, immaculata ; ad margines sinuato-dentata, dentibus corneis pungentibus brunneis 4 mm. longis, 10—12 mm. inter se distantibus armata. *Inflorescentia* 2 met. alta, supra medium ramosa, ramis circiter 8. *Pedunculus* basin versus leviter complanatus, circiter 3 cm. diam., pruinosus. *Racemi* cylindrici, acuminati, ad 30—40 cm. longi, 6—7 cm. diam., 40—50 floribus sub-laxis. *Pedicelli* usque ad 9 mm. longi. *Bracteae* anguste lanceolato-acuminatae, subscariosae, obscure plurinerviae, 10—12 mm. longae. *Perigonium* latericium, 30 mm. longum, basi subgloboso-inflatum (9·5 mm. diam.), supra ovarium constrictum, (5·5 mm. diam.), deinde decurvatum et faucem versus ampliatum. *Segmenta exteriora* per 7 mm. libera, pallide marginata, apice subacuta, leviter recurvula ; interiora latiora, obtusiora. *Genitalia* brevissime exserta. *Ovarium* 8 mm. longum, basi 3 mm. diam. Succus foliorum purpurascens.

Hab.: Eastern Transvaal, Komatipoort, alt. 650 ft.; cultivated plant flowered 24th March 1936 in Johannesburg, Reynolds 1543 (type) in National Herbarium, Pretoria and Bolus Herbarium, Kirstenbosch. (Plate XVI.)

The species is described from a plant originally collected by Mr. Cyril Foster near Komatipoort, E. Transvaal, and which flowered in the Author's garden in Johannesburg during March, 1936. Mr. Foster records that the species is found in numbers a short distance upstream from the Immigration Office, Komatipoort, at an approximate elevation

of 650 feet. It is nearest allied to *A. zebrina* Bak, which occurs principally in Angola and Hereroland, and which up to the present does not appear to have been recorded so far east as the Transvaal. From Berger's account[4] *A. zebrina* is described "*sobolifera . . . folia . . . undique, praesertim subtus, striata maculisque magnis oblongis . . . picta.*" The Komatipoort specimen is a large plant, and has thrown up no suckers in 12 months, while the lower surface of the leaves is unspotted. The marginal teeth of *A. komatiensis* are smaller and more crowded, while the inflorescence is 6 feet high. From Berger's fig. C, the raceme of *A. zebrina* terminates in a tuft of bracts, whereas in *A. komatiensis* the buds are lax, the bracts at apex being fewer and not tufted. There are also differences in the flowers. From a comparison of Berger's fig. D. of a flower, with those illustrated on the accompanying plate, it will be seen that in *A. komatiensis* the perianth is comparatively narrower, less inflated at base, less constricted above the ovary, and less enlarging towards the throat. Another important distinguishing character is that the leaf sap dries purplish, while *A. zebrina* is described "*succus foliorum flavens.*" To summarise, *A. komatiensis* is distinguished from *A. zebrina* principally by plants not suckering freely, the leaves not spotted below, the differently shaped flowers, and the leaf sap drying purple.

Description.—Herb succulent, with stem up to 20 cm. long, apparently not suckering. *Leaves* 16—24, densely rosulate, lanceolate-attenuate, rather fleshy, up to 40 cm. long, 12 cm. broad, arcuate-spreading in lower portion, slightly recurved in upper quarter; upper surface flat near base, slightly canaliculate near apex, dull green, obscurely lineate and obscurely spotted throughout, the large dull white oval spots confluent and arranged more or less into a series of undulating, interrupted transverse bands; lower surface convex, duller green, obscurely lineate, immaculate; the margins sinuate dentate, armed with brown deltoid pungent slightly deflexed teeth 4 mm. long, 10—12 mm. distant. *Inflorescence* 2 met. high, branched slightly above the middle, with about 8 arcuate-erect branches, the 1—3 lowest with 1—3 branchlets forming a rather compact panicle of about 12 racemes, the lowest branches subtended at base by subscarious attenuate bracts 4—5 cm. long, the bracts with a few marginal teeth near apex. *Peduncle* slightly flattened low down and about 3 cm. diam., lightly covered with a greyish powdery substance. *Racemes* cylindric, slightly acuminate, the terminal the highest, about 40 cm. long, 6—7 cm. diam., rather loosely about 40—50-flowered, the lateral shorter, fewer flowered, about 30 cm. long. *Pedicels* lowest of terminal raceme up to 9 mm. long, slightly longer in the fruit. *Bracts*

[4] *Vide* Engler: Das Pflanzenreich, Liliac.-Asphodel.-Aloin, p. 207.

narrowly lanceolate-acuminate, thin, subscarious, obscurely many nerved, somewhat brownish, slightly longer than the pedicels. *Perianth* dull brick-red, 30 mm. long, with a subglobose basal swelling 9·5 mm. diam., constricted to 5·5 mm. above the ovary, thence slightly decurved and enlarging a little towards the throat, the mouth wide open. *Outer segments* free for 7 mm. from apex, the free portion with dull white 1 mm. wide marginal border, very obscurely many-nerved, the apices subacute, spreading. *Inner segments* dorsally adnate to the outer for their greater length, broader than the outer and with broader dull white marginal border, the apices more obtuse and more spreading. *Filaments* pale lemon, flattened, the 3 inner lengthening in advance of the 3 outer, the outer twice as broad near base as the inner. *Anthers* the 3 inner and 3 outer in turn exserted 1—2 mm. *Style* pale orange low down, paler upwards, with the stigma at length exserted 1—2 mm., and remaining exserted after pollination. *Ovary* light green, 8 mm. long, 3 mm. diam., slightly tapering into the style, finely 6-grooved. After 12 hours the leaf sap dries purplish.

Aloe pruinosa, Reynolds, species nova et distincta in sectione *Saponariarum, A. Greenii,* Bak. affinis, sed foliis longioribus, pedunculis longioribus differt. *Herba* succulenta, caulibus usque ad 30 cm. longis. *Folia* 16—24, dense rosulata, lanceolato-attenuata, patentia, recurvula, usque ad 70 cm. longa, 10 cm. lata ; supra canaliculata, subtus convexa, ubique, praesertim subtus, maculis copiosis oblongis confluentibus irregulariter transverse undulato-fasciatis picta, margines sinuato-dentati, dentibus deltoideis pungentibus 3—4 mm. longis, 15—20 mm. distantibus armati. *Inflorescentia* circiter 2 met. alta, pedunculus supra medium 9—12-ramosus, valde glauco-pruinosus. *Racemi* cylindrico-acuminati, terminali usque ad 20 cm. longi, basi 7 cm. diam. *Bracteae* anguste lanceolatae, acuminatae, scariosae, plurinerviae, 10—12 mm. longae. *Pedicelli* 10—12 mm. longi. *Perigonium* 30—33 mm. longum, sordide rubro-brunneum, valde glauco-pruinosum, basi inflatum, (8 mm. diam.) supra ovarium valde constrictum, (5 mm. diam.) decurvatum et faucem versus ampliatum. *Segmenta exteriora* per 7 mm. libera, ad margines albida, interiora libera, latiora, obtusiora. *Genitalia* per 1—2 mm. exserta. *Ovarium* 8 mm. longum, basi 3 mm. diam.

Hab : Natal, 10 miles south-east of Pietermaritzburg on the road to Durban, among thorn bushes, cultivated plant flowered 15th March, 1936, in Johannesburg, Reynolds 377 (type) in National Herbarium, Pretoria, and Bolus Herbarium, Kirstenbosch. Plant No. 1611/34 in National Botanic Gardens, Kirstenbosch, and No. 1195.4.36 in Garden of the Botanical Section, Division of Plant Industry, Pretoria. (Plate XVII.)

Fig. 2.

Fig. 1.

PLATE XVII. *Aloe pruinosa*, Reynolds.

FIG. 1. Plant collected by the author near Fairview, 10 miles south-east of Pietermaritzburg, Natal, flowering 14 March, 1936, in his garden in Johannesburg; height 6 feet.

FIG. 2. Flowers natural size, from the bud to post-pollination stage.

FIG. 1. FIG. 2. FIG. 3.

PLATE XVIII. *Leptaloe Saundersiae*, Reynolds.

FIG. 1. Plants ($\times \frac{1}{5}$) collected by Lady Saunders in the Nkandhla Dist., Zululand, flowering 15 March, 1936, in Johannesburg.
FIG. 2. Raceme, with portion of the peduncle, natural size.
FIG. 3. Flowers natural size, from bud to fruit stage.

This distinctive species occurs in thorn country in the vicinity of Fairview (formerly known as Thornybush), about 10 miles south-east of Maritzburg, on the road to Durban. In size of rosette and leaf, and in height and branching of the inflorescence, *A. pruinosa* resembles the robust form of *A. Dyeri* Schonl. found near Waterval Boven, Kaapsche Hoop and elsewhere in the mountainous parts of the Eastern Transvaal, but the latter cannot be confused with its peculiar leaf spotting, longer more cylindric racemes, and the different size and shape of its much redder flowers.

A. pruinosa appears to be nearest allied to *A. Greenii* Bak. which also occurs near Maritzburg, but it is a much larger plant, differing in too many respects to be regarded merely as a very robust growth form of *A. Greenii*. *A. pruinosa* occurs mostly as solitary plants, rarely in small groups, and develops a stem up to 30 cm. long, whereas *A. Greenii* suckers freely, soon forms dense groups, and has little or no stem. The former has leaves more spreading, up to 70 cm. long, with the rosette 1·3 to 1·6 met. diam., while the latter has shorter more erectly-recurved leaves up to 40 cm. long, of a more yellowish-green colour, with the spots in more defined transverse bands, especially below. In the inflorescence there are many differences. In *A. Greenii* the inflorescence is usually about 1—1·25 met. high and with 4—7 sub-erect branches, the racemes are more cylindric, the buds laxer, with the flowers light to dark flesh-pink, "ranging from Corinthian pink to Dragons blood red"—R.C.S.[5] In *A. pruinosa* the inflorescence reaches 2 metres in height, the racemes are denser and more conic, while the flowers are a peculiar very dull brownish-red. A very striking feature of this species is that the peduncle and flowers are heavily coated with a greyish powdery substance, giving the racemes a very dull appearance, on which account the above name is proposed. The species is described from observations near Fairview, and from plants which flowered in Johannesburg during March 1934-35-36.

Description.—Stem up to 30 cm. long. *Leaves* 16—24, densely rosulate, lanceolate-attenuate, up to 70 cm. long, 8—10 cm. broad at base, spreading and slightly recurved; upper surface canaliculate, green, with numerous white spots throughout, the spots somewhat "H" shaped, scattered, or sometimes confluent into a series of more or less wavy irregular interrupted transverse bands; lower surface convex, the spots more copious, more elliptic, and in more defined transverse bands; the margins sinuate-dentate, the teeth deltoid, pungent, pale pinkish-

[5] R.C.S. refers to colours taken from Ridgway's "Color Standards and Color Nomenclature," Washington, 1912.

brown, up to 4 mm. long, 15—20 mm. distant, slightly deflexed, smaller and more crowded near base, larger and more distant upwards. *Inflorescence* 2 metres high, branched above the middle, with about 11 arcuate erect branches, the 1—3 lowest with 1—2 branchlets forming a rather compact panicle ; the lowest branches subtended at base by sub-scarious acuminate bracts up to 10—13 cm. long. *Peduncle* flattened and up to 4 cm. diam. low down, gradually semi-terete upwards, brown, copiously covered with a greyish powdery substance. *Racemes* cylindric-conic, the terminal up to 20 cm. long, 7 cm. broad, the lateral shorter and usually about 10—12 cm. long, unicoloured, the buds suberect and rather congested, gradually laxer downwards, with the open flowers about 10 mm. distant, cernuous to subpendulous, dull dark brownish-red (Pompeian Red to madder red R.C.S.). *Bracts* narrowly linear-lanceolate, acuminate, spreading and recurved, about 7—9-nerved, as long as the pedicels or slightly longer. *Pedicels* the lowest 10—12 mm. long. *Perianth* 30—33 mm. long, with a sub-globose basal swelling 8 mm. diam., constricted to 5 mm. above the ovary, thence rather sharply decurved, enlarging towards the throat (8 mm.), and laterally compressed to about 5 mm. *Outer segments* free for 7 mm. from apex, very obscurely many nerved, with 1 mm. broad white marginal border, and with sub-acute slightly spreading apices. *Inner segments* free to base, but adnate dorsally to the outer for their greater length, broader than the outer, with the apices more obtuse and slightly more spreading, and with the dull white marginal border twice as broad as the outer. *Filaments* flattened, the 3 inner narrower and lengthening in advance of the 3 outer. *Anthers* the 3 inner and 3 outer in turn exserted 1—2 mm. *Stigma* at length exserted 1—2 mm. and remaining exserted after pollination. *Ovary* 8 mm. long, 3 mm. diam. at base, slightly tapering into the style, finely 6-grooved, green. The leaf sap dries deep violet.

Leptaloe Saundersiae, Reynolds, species nova, *L. minima* (Bak.) Stapf affinis, sed foliis brevioribus immaculatis, floribusque minoribus differt. Acaulis. *Folia* 10—14 multifaria, patentia, e basi paullum dilatata, anguste linearia, 5—6 cm longa, 3 mm. lata, supra canaliculata, immaculata, subtus convexa, laevia, immaculata, vel basin versus maculis albis minutis paucis picta, marginibus dentibus minutis crebris ciliata. *Pedunculus* gracilis, 15—20 cm. longus, bracteis vacuis 6—8 scariosis ovato-acuminatis 10—12 mm. longis praeditus. *Racemus* capitatus, 2·5 cm. longus et latus. *Pedicelli* 3—4 mm. longi. *Bracteae* scariosae ovato-acuminatae 3—4 mm. longae. *Perigonium* basi attenuatum, cylindricum, rectum, 8 mm. longum. *Segmenta* exteriora libera, obscure 3-nervatis, marginibus pallidioribus ; interiora libera, paullum

longiora, obtusiora. *Genitalia* vix exserta. *Ovarium* 2 mm. longum, 1 mm. diam.

Hab : Zululand, near Nkandhla Forest, cultivated plants flowering in Johannesburg 15th March, 1936, Reynolds 1799 (type) in National Herbarium, Pretoria. Plants 1666.3.36 in Garden of Botanical Section, Division of Plant Industry, Pretoria, and 789/36 in National Botanic Gardens, Kirstenbosch. (Plate XVIII.)

This small and distinctive *Leptaloe* was first collected by Lady Saunders in February 1931 near the Nkandhla Forest, between Eshowe and Nkandhla, Zululand, and is named in honour of the collector, to whose enthusiasm and extensive collectings South African Herbaria are indebted for much valuable material. Lady Saunders records that in the wild state this species is found in crevices or on flat rock faces, in exposed positions, frequently in dense groups of several dozen plants, somewhat resembling tufts of short grass. In their natural habitat, the leaves turn reddish in winter, and rarely exceed 5—7 cm. in length, but in cultivation they reach twice that length.

In rosette and leaf, *L. Saundersiae* is closely allied to *L. albida* (Bak.) Stapf, but the latter is immediately distinguished by its shorter peduncle, and by the larger, dinstinctly bilabiate white flowers with upturned mouth. Another near ally is *L. minima* (Bak.) Stapf,[6] but this is a larger plant differing in many characters, as is shown in the following table.[7]

L. minima.	*L. Saundersiae.*
Plants solitary among grass.	In dense groups on rocks.
Leaves 12—30 cm. long, sub-erect.	5—7 cm. long, spreading and recurved.
Inflorescence 15—30 cm. high.	10—20 cm. high.
Pedicels 8—15 mm. long.	3—4 mm. long.
Perianth 10—12 mm. long, pale reddish or pale red-lead coloured.	8 mm. long, creamy pinkish-mauve in colour.

Another striking distinguishing character is that in *L. minima* the leaves are copiously spotted dorsally, with the spots sub-tuberculate, sub-spinulescent, and rough to the touch, whereas in *L. Saundersiae* the leaves are smooth and unspotted. With flowers only 8 mm. long, *L. Saundersiae* is closely allied to *L. parviflora* (Bak.) Stapf, but the latter has fewer longer distichous leaves, which are tubercular-muricate, a longer peduncle and pedicels three times as long.[8]

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[6] *Vide* Hook. Icon. plant. (1895) tab. 2423.

[7] Fortunately the type material of *L. minima* is preserved in S. Africa ; Maurice S. Evans 409 ! flowers light scarlet, among grass, South Downs, Weenen County, February, 1895, alt. 5-6000 ft. No. 19582 in Herb. Natal.

[8] *Vide* Engler : Das Pflanzenreich, Liliac.-Asphodel.-Aloin. (1908), p. 165, fig. 55.

Description.—Stemless, in dense groups. *Leaves* 10—15, multifarious, narrowly linear, 5—6 cm. long, (up to 10—15 cm. in cultivated plants), 3 mm. broad at base, slightly dilated below ground : upper surface canaliculate, green, immaculate ; lower surface convex, smooth, green, immaculate or with very few obscure dull white spots near base ; the margins armed with minute rather soft white deltoid teeth about ½ mm. long and 1 mm. distant near base, smaller and more crowded upwards. *Inflorescence* simple, capitate, 15—20 cm. long, sometimes 2 from a rosette. *Peduncle* terete, 1—1½ mm. diam., sterile-bracteate from below the middle with 5—8 scattered thin scarious white ovate-acuminate bracts up to 10—12 mm. long, about 5 nerved, basally amplexicaul, spreading above. *Raceme* capitate, about 2·5 cm. long and broad, about 12—15 flowered, the buds subercct and slightly congested, the open flowers slightly laxer, horizontally disposed or subcernuous. *Bracts* ovate-acuminate, as long as the pedicels, spreading, thin, white, subscarious, with 3 pinkish nerves confluent at apex. *Pedicels* 3 mm. long, 4—5 mm. in the fruit. *Perianth* cylindrical, 8 mm. long slightly tapering into the pedicel, rather creamy pale pinkish-mauve, paler at mouth, the mouth not bilabiate. *Outer segments* free, with thinner white margins, obscurely 3-nerved, the nerves confluent, dull pinkish for their greater length, turning somewhat brownish at apex, the apices sub-acute straight. *Inner segments* free, not cohering dorsally to the outer, broader and slightly longer than the outer, with wider white marginal border and with more obtuse apices than the outer, 3-nerved. *Filaments* filiform, slightly flattened, the 3 inner very slightly narrower and lengthening in advance of the 3 outer. *Stamens* and *style* as long as the perianth with the anthers and stigma not exserted. *Ovary* 2 mm. long, 1 mm. diam. at the middle, very finely 6-grooved, brownish.

EUPHORBIA PSEUDOGLOBOSA Marloth.

(With Plate XIX.)

By Dr. John Muir and Professor R. H. Compton.

Euphorbia pseudoglobosa was published as a new species by the late Dr. R. Marloth in South African Gardening, XIX, 191, 1929, the type specimens being *Muir* 4089 from near Krombeks River, Riversdale District. Marloth stated that he had only seen male specimens, and his description applies only to that sex: a photograph of a male plant accompanies the description. A copy of Marloth's photograph is reproduced herewith (Plate XIX, fig. 1).

In 1933 there remained only a single plant of the original gathering, *Muir* 4089, this being fortunately a female. It was then photographed and a description was made. Cuttings were taken from it for propagation (they grew well but were later destroyed by a servant), and the remainder of the plant was dried and deposited in the National Herbarium, Pretoria. The photograph of this female plant is reproduced as Plate XIX, fig. 2. The following is the description, made (by J.M.) from the living plant.

Euphorbia pseudoglobosa, Marloth (Euphorbiaceae-Euphorbieae).

Main stem underground, cylindrical or slightly tapering. *Branches* jointed, dimorphic, the younger globose, the older oblong and elongated, unarmed, glabrous; at first buried flush with ground, 5—6-angled, producing later 2—3 globular or nearly spherical joints also mostly 5-angled, from 10—15 mm. in diameter; the older branches 16—20 mm. thick and up to 42 mm. long, 5 or often 7 angled; all dull green, tessellately tuberculate with blunt flattish tubercles. *Leaves* succulent, sessile, lanceolate or ovato-lanceolate, acute, ciliate, 1—1·5 mm. long, green becoming reddish on margins, soon withering leaving a whitish scar at first red-margined. *Peduncles* 2—7 at ends of branches, about 1 mm. long bearing three oblong, truncate bracts which are minutely ciliate, pubescent internally, slightly keeled towards apex and cuspidate, green or slightly red tinged, and one or two smaller lower bracts the latter soon withering. *Cyathium* 1·5 mm. long, 2·5—3 mm. broad, glabrous.

Glands 5, transversely oblong, 1·5 mm. in long diameter, green, entire, ereeto-patent, eontiguous, finely pitted and rugulose. *Lobes of involucre* 0·75 mm. broad, fringed, pale yellow. *Styles* stout, exserted, green, 2 mm. long, united for ½ their length, with three spreading ehannelled tips which are bifid at apex ; stigmas and tips yellowish. *Ovary* green, shortly pedieellate, ovoid, glabrous, not exserted.

Flowering August—September. Does not belong to § *Dactylanthes.*

In cultivation the globular shape of the lateral stems is somewhat lost, a more cylindrieal form being produeed : this is noticeable as between the photograph of the male plant taken in 1929 and that of the female plant taken in 1933.

E. pseudoglobosa shows a certain resemblanee to the recently deseribed *E. juglans* Compton (Journ. S.A. Bot., I, 127, 1935). The latter has a relatively more massive root and the lateral stems are 6—9-angled, whereas the former has a smaller root and the lateral stems are 5—7-angled and tend to braneh seeondarily. There are also floral differenees whieh are summarised in the following table :—

	E. juglans.	*E. pseudoglobosa.*
Male Plant Involucre	3 mm. long	2 mm. long
	3 mm. diam.	4 mm. diam.
	pubescent	glabrous
Peduncle	4—6 mm. long	2·5 mm. long
Ovary	present (rudimentary)	absent
Inflorescence	of 1—2 cyathia	simple
Female Plant Involucre	1·5—2·0 mm. long	1·5 mm. long
	1·5—2·0 mm. diam.	2·5—3·0 mm. diam.
	pubescent	glabrous
Styles	joined at base	joined for half their length

Both *E. juglans* and *E. pseudoglobosa* have been grown for several years at Kirstenboseh and at Whitehill, where they have maintained their distinctness. Another somewhat similar speeies is *E. pyriformis*, N.E. Br., deseribed from a single male speeimen from an unknown locality eultivated in England, of which a Uitenhage plant grown at Whitehill (*Archer* 245) is probably an example. Other related but distinet plants are an undeseribed species from Touws River grown at Whitehill, and *Muir* 6593 from an unknown locality.

Fig. 1.

Fig. 2.

Plate XIX. *Euphorbia pseudoglobosa.*

Fig. 1. Photograph by the late Dr. Marloth of a male plant of *Muir* 4089 (Untouched).

Fig. 2. Photograph by Dr. Muir of a female plant of *Muir* 4089 from garden, 6 August, 1933.

SOME NOTES ON HYBRIDISATION OF ERICACEAE IN THE KLAVER VALLEY AT SIMONSTOWN.

By

Paymaster Captain T. M. Salter, R.N. (Ret.).

I. Supposed inter-generic hybrids (Blaeria × Simocheilus).

Examination of an extensive collection of specimens of *Blaeria ericoides*, L. and *Simocheilus depressus*,* Benth., recently made by me in the Klaver Valley, Simonstown (during February, 1936) has revealed a large number of intermediates between these two plants.

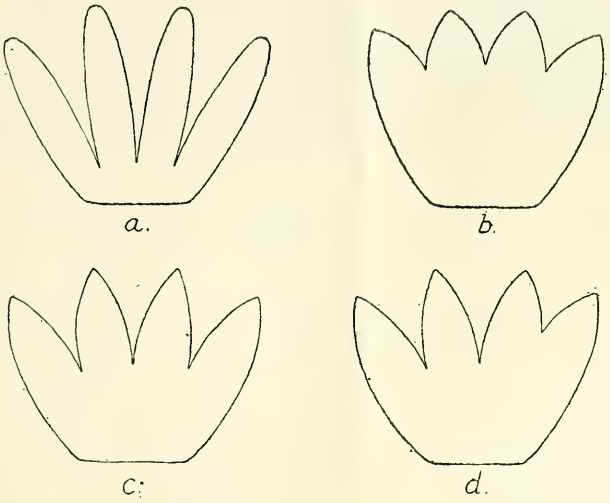

Fig. 1. Calyces lying flat. a, *Blaeria ericoides*. b, *Simocheilus depressus*. c, Normal hybrid. d, *Salter* 5936. All × 20. Del. T. M. Salter.

The two supposed parents are very similar in appearance and although, with practice, the pure, or at any rate the extreme forms can be recognised with the naked eye, some of them (apart from the hybrids)

* And/or *Simocheilus glabellus*, Benth., which, as the late Dr. N. E. Brown seems to have suspected, is probably conspecific (*vide* Flora Capensis, Vol. IV, Sec. I, p. 365).

required close examination with a lens before they could be allocated to their respective genera. Both are abundant in the vicinity and often grow in association.

The characters upon which I have formed my conclusions, indeed the only really obvious characters separating these two plants, are as follows :

Blaeria ericoides, L. Sepals almost free. Ovary 4-celled : cells 2—10-ovuled.

Simocheilus depressus, Benth. Calyx with 4 converging teeth about $\frac{1}{3}$ the length of the tube. Ovary 2-celled : ovules solitary in each cell.

In the case of the supposed hybrids, *Salter* 5815, 5887, 5890, 5912, 5914, 5915, 5917, 5918, 5919, 5935, 5936, 5938, 5941, and 5942, the calyx teeth are almost all about equal in length to the tube, but not so closely converging (i.e., squeezing the corolla) as those in Simocheilus. In one plant, however, (*Salter* 5936) the calyces are remarkable, two of the teeth being short and converging inwards slightly, while the other two are about equal in length to the tube as in the normal hybrids. (See Fig. 1 (*d*).) A summary of the particulars of the ovaries of 85 flowers, taken at random from 15 of these plants, is shown in the following table :

Ovary-cells.	*Ovules.*	*Flowers so found.*
4	2–2–2–2	4
4	1–1–1–1	3
3	4–3–2	1
3	2–1–1	7
3	1–1–1	11
2	7–3	1
2	4–3	1
2	5–2	1
2	4–2	3
2	3–2	17
2	3–1	5
2	2–2	14
2	2–1	13
2	1–1	2
1*	7	1
1*	6	1

The bracts vary from 1 to 3, two being the commonest number and in a few plants the anthers are spurred.

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* In these cases and in several others, traces were found of rudimentary septa, not reaching to the central axis. See Fig. 2 (*a*) and (*b*). The ovules are pendulous on the upper swollen portion of the central axis and, where numerous, are somewhat imbricated as in *Blaeria ericoides*. See Fig. 2 (c).

Some of the plants show a marked tendency to abnormality and monstrosity in the flowers, a fact which seems to provide further evidence of their hybrid origin. Sixteen flowers, forming one inflorescence from *Salter* No. 5936 illustrate this point :—

No. of flowers.	*Details of structure.*
9	.. Normal. Calyx and corolla 4-lobed. Stamens 4.
4	.. Calyx and corolla 4-lobed. Ovary, style and stamens absent.
1	.. Calyx 8-lobed, containing 2 complete otherwise normal flowers.
1	.. Calyx 6-lobed, with a second 3-lobed partial outer calyx imbricating it. Corolla 8-lobed. Ovaries 2 ; styles 2 ; stamens 8.
1	.. Calyx and corolla 5-lobed. Stamens 5.

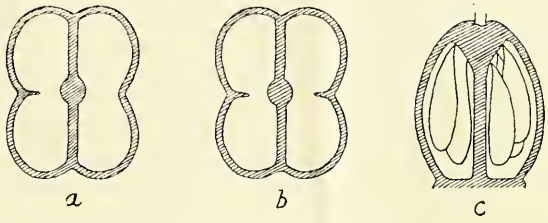


Fig. 2. *Blaeria ericoides* × *Simocheilus depressus*. a and b, Cross section of ovaries. c, Vertical section of ovary showing placentation. All × 20. Del. T. M. Salter.

The ovary-cells and number of ovules were also variable.

It is very possible that the plants previously referred to, which, although conforming to the recognised generic characters, could not be distinguished by their appearance, may be segregates very closely related to the original parents.

The foregoing evidence of hybridisation between these two genera raises the question whether the division of the South African minor Ericaceae into micro-genera has been carried too far. Almost the whole classification of these plants into genera and species has been carried out by European botanists on the evidence of an absurdly limited quantity of material and it is only after attempting to dissect old dried specimens in these genera that their patience can be realised. It is very desirable that these plants should be more extensively collected in order to enable some future monographer more opportunity of reviewing them. Owing to their variation a number of small specimens from several plants growing in one locality are of infinitely more value than one large showy specimen, but the rough height and nature of the plant should of course be stated.

II. Supposed Erica hybrids.

While investigating the plants referred to in Seetion I., I found, also in the Klaver Valley, Simonstown, a number of apparent hybrids :— (*a*) *Erica laeta*, Bartl. × *Erica heleogena*, Salter and (*b*) *Erica hirtiflora*, Curt × *Erica heleogena*, Salter.

(*a*) *Erica laeta*, Bartl. × *Erica heleogena*, Salter. Of the speeimens of this hybrid colleeted (*Salter* 5795, 5893, 5895, 5894, 5927 and 5928) partieulars of the floral eharaeters of the first three, as compared with those of *E. laeta* (*Salter* 5899) and *E. heleogena* (*Salter* 5797) are shown in Fig 3.

In all the speeimens the habit of the plant is intermediate, that of 5795 being nearest *E. laeta*, that of 5895 nearest *E. heleogena* and 5893 is between the two. Generally speaking a similar transition ean be traced in the leaves and in the floral charaeters, e.g., the shape and indument of the corolla, length of the anther appendages, ete. The same transition is, however, not borne out in the eolour of the eorolla, in faet the opposite is the case ; 5795 being pale rose, 5893 rose and 5895 rose-red, but all the hybrids are intermediate in colour between the parents. None of them has mutieous anthers as in *E. heleogena* ; the awns, some of which are shortly decurrent on the filaments, vary in length, but I can find no perceptible traee of the eharacteristic laceration of the anther-erests of *E. laeta*.

(*b*) *Erica hirtiflora*, Curt × *Erica heleogena*, Salter. A large range of specimens of this hybrid was colleeted (*Salter* 5896, 5929, 5959, 5962 and also 5897, 5931 to 5933, 5960, 5961, 5963 to 5966 and 5968. Partieulars of the floral characters of the first four together with those of *E. hirtiflora* (*Salter* 5898) are shown in Fig. 3.

All the specimens show intermediate charaeters, the corollas being noticeably hispid, though less so than in *E. hirtiflora*, and always having a tendency to elose at the mouth. The anthers vary but are all more or less intermediate in shape, and the long narrow crests of E. *hirtiflora* are much redueed in size.

In these, however, a definite transition is not so easy to traee. In general appearance and in the shape of the corolla 5896 is perhaps nearest to *E. hirtiflora* and 5892 to *E. helcogena*, but the other charaeters are somewhat indeterminate. The corollas of 5896 and 5962 are very pale pink and 5929 and 5959 a darker and more rosy pink, but still paler than *E. hirtiflora*.

These hybrids were far more numerous than those referred to in Section II. (*a*), four of them, all varying, being found almost within reaeh of one another, and hybridisation here seems to have reached a more complicated stage.

Fig. 3 (1).

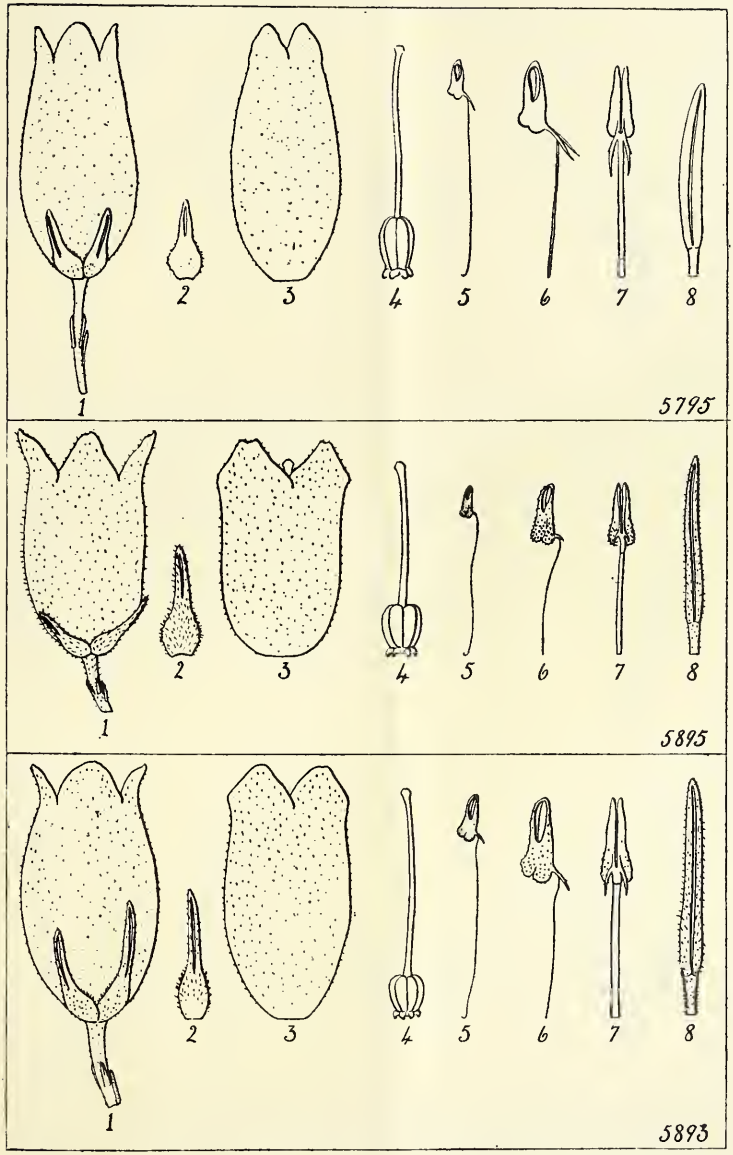
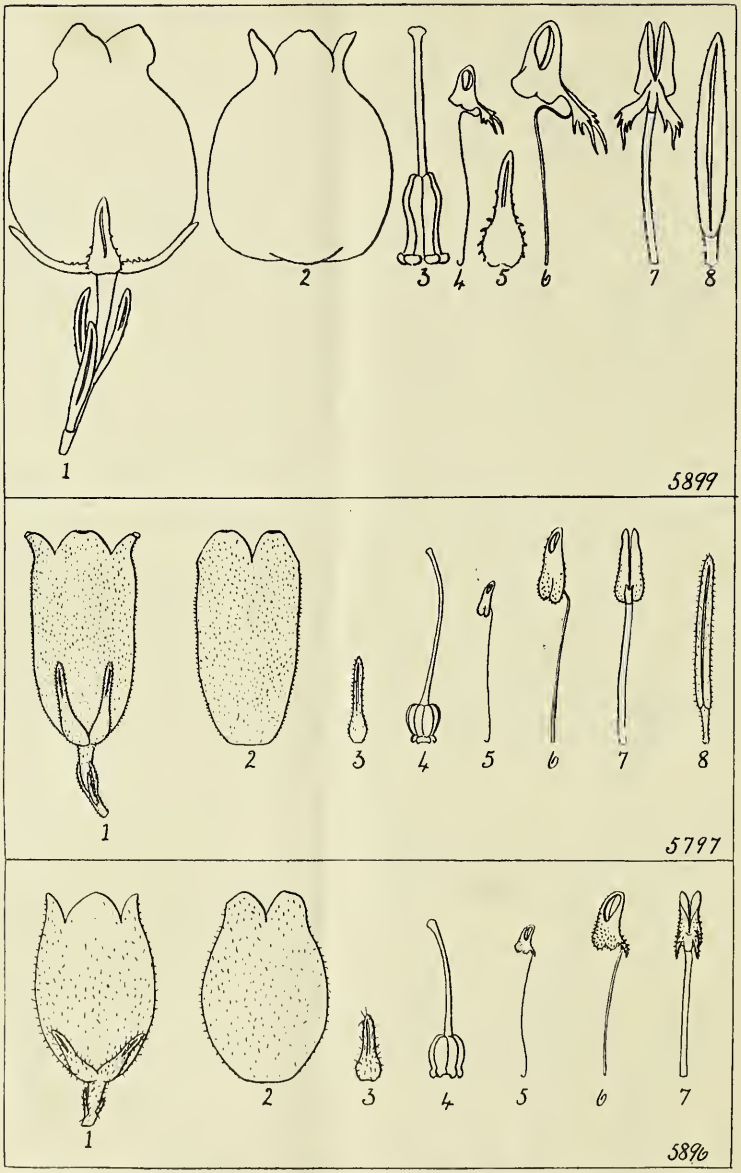


Fig. 3. 5795, 5895, and 5893. *Erica laeta* × *Erica heleogena*. 1. Flower × 6. 2. Sepal × 6. 4. Gynaecium × 6. 5. Stamen, side view × 6. 6. Anther, side view × 12. 7. Anther, back view × 12. 8. Leaf × 6.

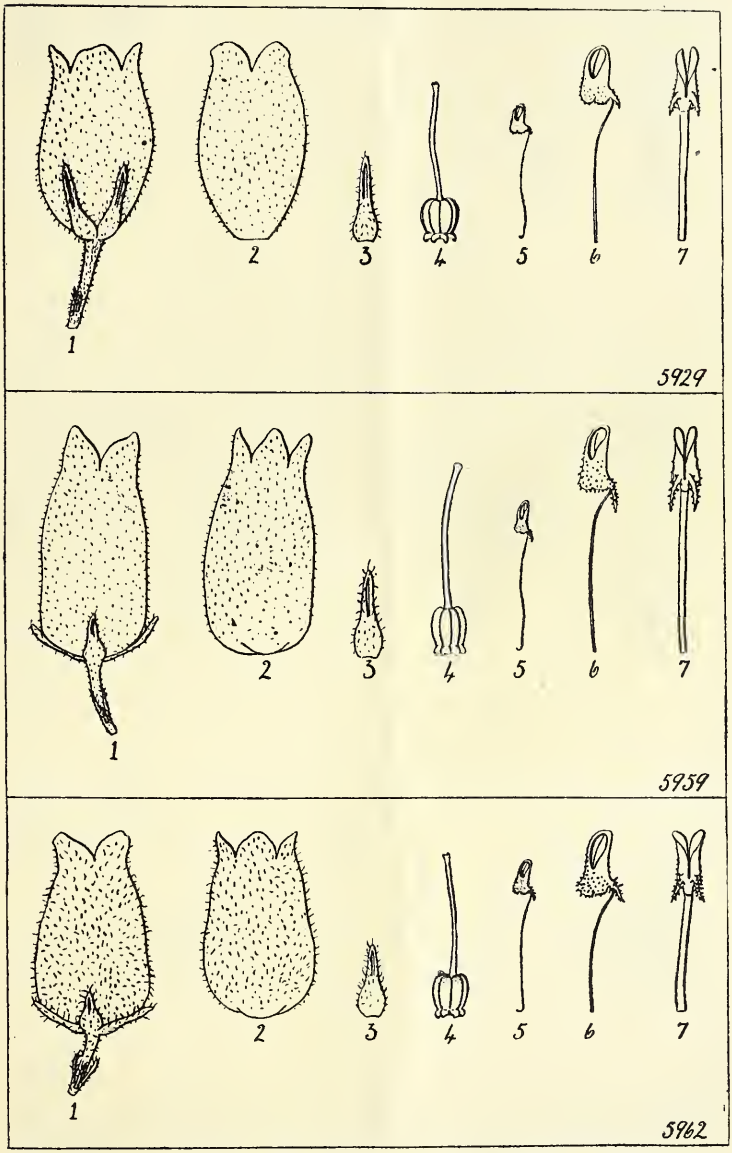
Fig. 3 (2).



5899. *Erica laeta*, Bartl. 1. Flower × 6. 2. Corolla × 6. 3. Gynaecium × 6. 4. Stamen, side view × 6. 5. Sepal × 6. 6. Anther, side view × 12. 7. Anther, back view × 12. 8. Leaf × 6.

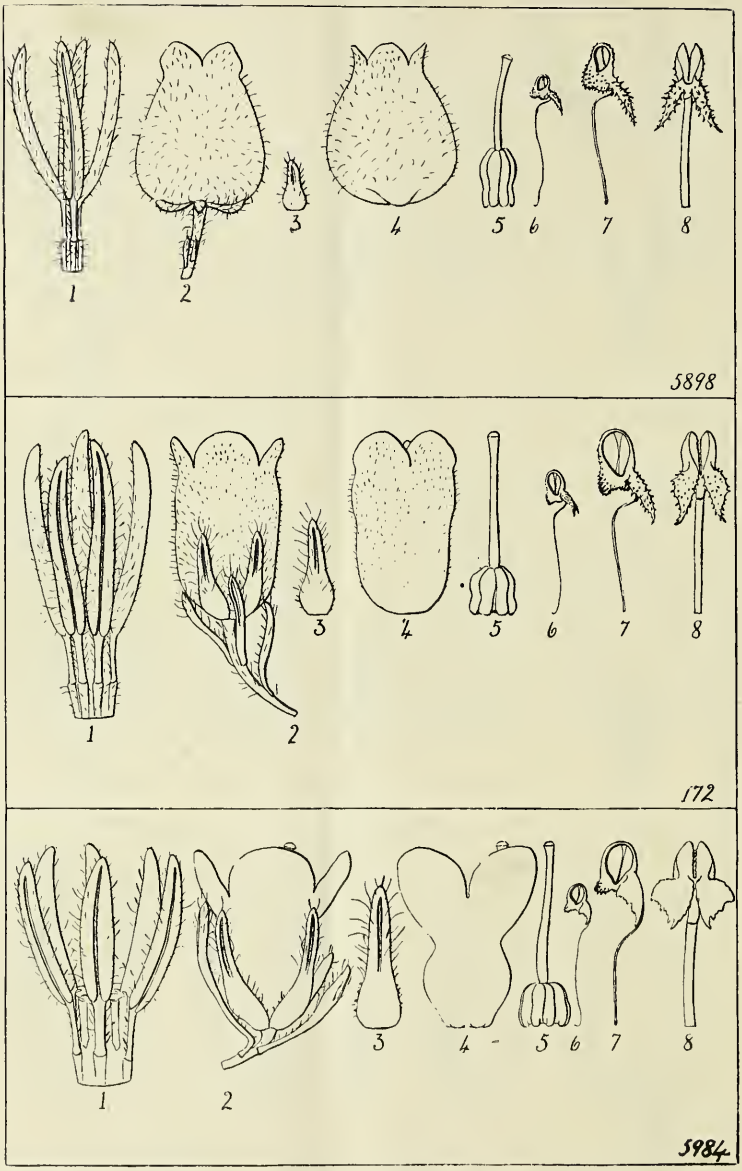
5797. *Erica heleogena* Salter. 1. Flower × 6. 2. Corolla × 6. 3. Sepal × 6. 4. Gynaecium × 6. 5. Stamen, side view × 6. 6. Anther, side view × 12. 7. Anther, back view × 12. 8. Leaf × 6.

Fig. 3 (3).



5896, 5929, 5959 and 5962. *Erica hirtiflora* × *Erica heleogena*. 1. Flower × 6. 2. Corolla × 6. 3. Sepal × 6. 4. Gynaecium × 6. 5. Stamen, side view × 6. 6. Anther, side view × 12. 7. Anther, back view × 12.

Fig. 3 (4).



5898. *Erica hirtiflora* Curt. 172. *Erica hirtiflora* × *Erica pyxidiflora*. 5984. *Erica pyxidiflora* Salisb. 1. Whorl of leaves × 6. 2. Flower × 6. 3. Sepal × 6. 4. Corolla × 6. 5. Gynaecium × 6. 6. Stamen, side view × 6. 7. Anther, side view × 12. 8. Anther, back view × 12. *Del.* W. F. Barker.

The marsh in which the hybrids occur is of considerable extent. It is the most southerly marsh in the valley, i.e., the highest on the main stream, and lies to the west of the point marked " Graves " on the Cape Peninsula map (1933). *Erica heleogena*, a true marsh species, is abundant in the marsh while *E. laeta* and *E. hirtiflora*, which might be described as semi-marsh species, preferring as they do the edges of marshes and banks of streams, are very plentiful on either side of it, while a limited number of both species occur in the marsh itself. The hybrids were all found in the marsh and near the supposed parents, but they do seem to grow away from *E. heleogena* on the drier borders.

I walked across this marsh some few years ago soon after it had been gutted by a fire which destroyed all the living heaths in it. In many parts of it progress is now difficult owing to the dense waist-high, or in places head-high vegetation and I observed a plant of *E. heleogena* over 6 feet high with the base of the stem nearly an inch in diameter. It is evident that much of the huge quantity of seed that falls from the closely matted plants of this heath must lie dormant in the soil and ready to germinate and reclothe the marsh when room is made for it by the removal of its forbears, a fact borne out by the appearance of numerous seedling plants in a recently burnt part of the same marsh.

Direct hybridisation and inter-hybridisation of segregates has in all probability been going on in this locality for many years. It would be interesting to know whether these hybrids are on the increase and one can speculate whether, in the course of time, through some climatic or physical change, the marsh will ever become more suited to one of them than to the present predominating species *E. heleogena*, which might gradually take its place as a new so-called species.

A few seeds of both these supposed hybrids have been obtained and these, by the courtesy of the Director, will be planted at the National Botanic Gardens, Kirstenbosch. If they germinate successfully it is hoped that further confirmatory evidence of hybridisation will be obtained.

(*c*) On a later visit to the Klaver Valley in March a single plant was found by Miss W. F. Barker (*Barker* 172), which has all the appearance of being a hybrid between *Erica hirtiflora*, Curt. and *Erica pyxidiflora*, Salisb., two species which were growing plentifully in the same vicinity, but which do not, from their appearance, seem to have any close affinity one with the other and are included in entirely different sub-sections of the genus. There was at first some doubt about the possibility of a cross between these species, as the latter was not in flower, but on making an exhaustive, but unsuccessful search for more of these plants

about a month later, the flowering of the supposed parents was found to be just overlapping.

E. hirtiflora, which is, at any rate in the upper part, a rather densely bushy species with very numerous flowers, terminal on short branchlets, and with 4-nate leaves, was growing locally to about 70 cm. in height. In *E. pyxidiflora* the branches are few, long, erect and widely separate, with closely imbricate leaves, which are most commonly 6-nate : the inflorescences are compact and cylinder-shaped with congested axillary flowers and the height is generally 40—50 cm.

The hybrid is intermediate in habit and about 30 cm. in height, but is evidently a young plant. The flowers, terminal on very short branchlets, are arranged in long pseudo-racemes and the leaves which are more loosely imbricate are mostly 5-nate or rarely 4-nate. The corolla is rosy-pink in colour, *i.e.* intermediate between the parents.

Dissections of the flowers in comparison with those of *E. hirtiflora* (*Salter* 5898) and *E. pyxidiflora* (*Salter* 5984) are shown in Fig. 3. The corolla is nearest to that of *E. hirtiflora*, but has a much wider mouth and there are slight traces of the characteristic constriction so noticeable in *E. pyxidiflora*. The other intermediate characters, *e.g.* the bracts, sepals and anther crests are self-evident. The pollen grains which are slightly smaller than those of the parents, appear to be good and the ovules normal.

Mention has already been made in this Journal (Vol. I, pp. 35 and 82) of the hybrids *E. laeta*, Bartl., × *E. capensis*, Salter, and × *E. fontensis*, Salter (*i.e. E. capensis*, Salter, × *E. fontana*, L. Bolus), which occur in the more southern areas of the Cape Peninsula. No doubt, with careful observation, others will come to light.

Large numbers of artificial and accidental garden hybrid heaths are, of course, well known, but until quite recent years there seems to be no evidence of observation of their occurrence in the natural state. Owing to this lack of evidence it is impossible to ascertain whether any of our named wild species (some of which have been only once collected)* are merely hybrids, as is now known to be the case with some species in other genera which hybridise freely. It can scarcely be coincidence that the four almost certain hybrid combinations referred to in this article have been found growing within an area of less than one square mile. It seems, therefore, essential that the collector should be fully conscious

* It is a lamentable fact that so many of the "*types*" of our South African heaths were grown in Europe from seed of unknown origin.

of the possibility of finding hybrid forms, even between parents of very different appearance, and should, when coming upon an apparently new heath, either take careful note of what other species are growing in the vicinity, or, better, procure specimens of them as well, for not even the most erudite botanist can recognise all our 600 odd species of Ericaceae in the field.

I have, like most collectors, experienced the chagrin of having my discoveries determined as " nearest such and such " a species, a solution which seems at first sight to be most unsatisfactory. This state of affairs can only be understood after some experience of herbarium work and detailed investigation of plants which, on account of the existence of intermediate forms, have to be grouped together unless our so-called species are to swell to an infinite number. It is of course generally recognised that herbarium work, by its very essence, imposes an artificial system of sorting upon what are in reality the results of a continuous and ever-changing evolutionary process, but I believe that with careful field observation, such as I have outlined above, some light at least might gradually be shed on the mass of " variant " heaths which, to the despair of taxonomists, are now housed in herbaria, sometimes even without records of where they were collected and never with any notes on the species growing in association.

A specimen accompanied with full field notes is worth more to science than dozens of even " historical " specimens without them, as can well be realised when it is considered that any one of the hybrids referred to in this article would, without such notes, have almost certainly been looked upon by a monographer as a *new species.*

REVIEWS AND ABSTRACTS.

BESSEY, E. A. A Text-Book of Mycology. P. Blakiston's Son and Co. 1935.

In recent years several text-books dealing with the fungi have appeared but they have been either of too advanced a nature or have been too specialised to meet the needs of a junior student. The aim of this book is to provide a text-book of mycology suitable for first year students who have had a course in general botany.

The book covers a wide field, incorporating much recent research, and is a useful addition to the mycological library. Emphasis is laid on the morphological and systematic aspects of the subject and, as the author admits, scant attention is paid to the physiology of fungi. This latter fact will probably be regretted by many teachers of mycology, but in fairness it must be admitted that had the author attempted to include physiological studies the book would probably have become too bulky to serve its purpose as a junior text-book.

Here and there the need for condensation has resulted in somewhat perfunctory treatment. For instance, the section dealing with lichens would be unlikely to give students an adequate knowledge of that interesting and peculiar group of plants. A minor criticism is the author's use of the term disjunction as a synonym for segregation when dealing with nuclear behaviour in the basidiomycetes.

An excellent feature is the bibliography given at the end of each chapter which will enable the better students to pursue their studies further.

M. R. LEVYNS.

VAN LAREN, A. J. Cactus. Translated from the Dutch by E. J. Labarre. Arranged and edited by Scott E. Haselton. Cactus and Succulent Society of America. Abbey San Encino Press, Los Angeles, California. 1935.

This book represents a high peak of technical achievement among publications for the intelligent and instructed amateur. No purely scientific botanical book could appear in such handsome yet dignified paper, print and binding, or with such a wealth of admirably painted and reproduced illustrations. To conclude that cactus-collecting is a rich man's hobby in America is probably only one aspect of the truth: but the other implication that monetary support can be found for the publication of books fine in form but partial in scope, whereas treatises of fundamental value languish in unworthy dress, is only too well attested by the long parallel processions down the decades of stately popular works and shabby scientific ones.

But while we may regret the seedy garb in which botanical works so often appear, it would be churlish to begrudge to books of this kind their more seemly attire. The author, illustrators and publishers (though not always the proof-reader) are to be sincerely congratulated on a beautiful production which it is a pleasure to handle and peruse, and which will confirm cactus-lovers in their affections and lure others to join their ranks.

When can we hope for a similar book on the South African succulents?

R. H. COMPTON.

Ashby, M. The Genus *Hemizygia*, Briquet. Journ. Bot. LXXIII. 1935. 318 and 343.

This genus of the Labiatae stands in a position intermediate between *Orthosiphon* and *Ocimum*. The genus is essentially South African, with its centre of distribution in the Transvaal. It extends beyond into western tropical Africa. The number of species now recognised as belonging to *Hemizygia* is raised to 28. A key is given for their identification. Of the species 15 are now transferred from *Orthosiphon* or *Ocimum*. Three are described as new: *H. Obermeyerae*, Zoutpansberg; *H. rugosifolia*, Pietersburg; and *H. petiolata*, Zoutpansberg.

Dyer, R. A. The Seed Germination of certain Species of *Euphorbia*. S. Afr. Journ. Sci. XXXII. 1935. 313.

The germination and seedling characters of four succulent species of Euphorbia are described. Germination has a high percentage and is rapid. It is decided that seed and seedling characters are of little value for taxonomic purposes in this genus.

Gilliland, H. B. A new giant Lobelia from Rhodesian Manicaland. Journ. Bot. LXXIII. 1935. 247.

Lobelia Stricklandiae which is found in one locality on the mountains in the eastern part of Rhodesia is described. It is a plant growing 14-20 feet high and occurs in a sheltered kloof. The discovery forms an interesting southward extension of these large montane forms of the genus.

Léemann, A. C. The Blaauwberg in the Northern Transvaal. G. Karsten and H. Schenck: Vegetationsbilder XXIV. 8. 1935. (Text in English and German.)

The Blaauwberg forms a south-western extension of the Zoutpansberg. It rises 3,600 feet above the general level of the plateau, 3,000 feet. The vegetation of the slopes is of the Bushveld type, consisting of savanna passing into woodland. The upper portions extend into the "mist belt," but do not bear forests. There is a rather low open scrub with occasional fig trees. A number of species of *Helichrysum*, also *Erica*, *Stoebe*, and some others occur here. The flora is regarded as a relict one that has escaped destruction by fire to a large extent. There are eleven excellent photographs in illustration.

Léemann, A. C. Vegationsbilder aus den Magaliesbergen in der Hochebene von Transvaal. G. Karsten and H. Schenck: Vegetationsbilder XX. 3. 1931.

A short description and ten photographs of the vegetation of Wonderboompoort north of Pretoria, dealing especially with the "Wonderboom," *Ficus Pretoriae*.

Nordlinh, T. and Weimarck, H. Beitrage zur Kenntniss der Flora von Süd Rhodesia. III. Bot. Notis. 1935. 357.

This part deals with Capparidaceae, Polygalaceae, and Asclepiadaceae. 13 species are described as new and each is illustrated. The novelties are all in the Asclepiadaceae: *Xysmalobium amplifolium*, *X. dilatatum*, *Asclepias*

lilacina, *A. fimbriata*, *A. rhodesica*, *Schizoglossum gracile*, *S. leptoglossum*, *S. rhodesicum*, *S. lanatum*, *S. gigantoglossum*, *Cynanchum papillosum*, *Sisyranthus rhodesicus*, and *Brachystelma hirtellum*. Two species of *Polygala* are reduced to varietal rank.

Phillips, E. P. The genera Erythroxylon L. and Nectaropetalum Engl. S. Afr. Journ. Sci. XXXII, 1935. 305.

These two genera, which are the representatives of the Erythroxylaceae in South Africa, have been separated from one another on the numbers of chambers in the ovary and of the styles. These characters are found to be inconstant, and the two genera cannot be maintained as separate. The five South African species are placed in Erythroxylon. A key to the species is given.

There is a discussion on the possible lines of evolution of the South African species.

Phillips, E. P. An unrecorded Species of Gardenia from the Transvaal. S. Afr. Journ. Sci. XXXII, 1935. 320.

Gardenia spatulifolia Stapf and Hutch. which is found in the northern Transvaal, has been confounded with *G. Thunbergia* L.f. The differences between the two are pointed out. The discovery of this plant in the Transvaal is an extension of the distribution.

Phillips, E.P. Cultivated Native Grasses. Dept. Agric. and For. Sci. Bull. 146. 1935.

This contains descriptions and photographs of grasses that are cultivated at the experimental station at Prinshof, Pretoria. 12 species are included and illustrated with notes added on cultural features. The present is the first of a series to be issued. It is to be hoped that in later parts the reproduction of the photographs be improved. In the current part several have lost very considerably.

Rennie, J. V. L. On the Flora of a High Mountain in South-West Africa. Trans. Roy. Soc. S. Afr. XXIII. 1935. 259.

The Auas mountains, which lie south of Windhoek, rise to a height of 8,148 feet on the Moltke Blick. At the summits the vegetation consists of small-leaved bushes with grass and forms a decided contrast with the " Thornveld " of the slopes. In this summit vegetation there are a number of species of " Cape " plants. The station in South-West Africa marks a large extension of the known distribution of the plants, which is discussed, and also opens up new suggestions on the past history and migrations of the Cape flora.

R. S. Adamson.

JOURNAL

OF

SOUTH AFRICAN BOTANY

VOL. II.

PLANTAE NOVAE AFRICANAE.

" Ex Africa semper aliquid novi."—*Pliny.*

SERIES VII.

By

T. M. Salter, A. A. Obermeijer, C. E. B. Bremekamp and R. H. Compton.

Oxalis Knuthiana, Salter (Oxalidaceae), § Cernuae.

Planta robusta erecta ramosa glabra, saepe 20—30 cm., sed in umbrosis ad 70 cm. alta. *Bulbus* ovoideus vel oblongo-ovoideus, ad 7 cm. longus, tunicis numerosis papyraceis, exterioribus saepe ligulatis, atro-brunneis, ad marginem pallidioribus. *Rhizoma* ad 15 cm. longum, crassum, squamis semiamplexicaulibus ovatis indutum. *Caulis* valde ramosus, succulentus, ad basin 4 mm. diam. *Rami* alternantes, inferiores e squamis caulinis, superiores e foliorum axillis exorientes. *Folia* petiolata, inferiora alterna, rarius binata, superiora nonnunquam 2—4 verticillata, petiolis ad 5 cm. longis: foliola 3, minuta, breviter nigro-petiolulata, infra pubescentia, sed post anthesin evoluta, glabrescentia, latissime cuneato-obcordata, apice valde incisa, venata. *Pedunculi* axillares vel terminales, 3—8 cm. longi: bracteae ad 3 mm. longae, apice callis conspicuis aurantiacis ornatae: pedicelli 3—7, 1—1·5 cm. longi. *Sepala* ovato-lanceolata, ad 5 mm. longa, ad apicem purpurascentia, interdum minute penicillata, ecallosa. *Corolla* ad 1·3 cm. longa, lutea tubo breve late infundibuliforme concolore: petala sub-cuneata, antice plus minusve rotundata, prope basin oblique attenuata, ad 8 mm. lata, ad marginem exteriorem anguste rubro-purpurea. *Filamenta* minute glandulosa (parte connata inclusa) exteriora 2·5—3 mm., interiora 3·5—5·5 mm. longa, dentibus brevissimis late truncatis induta. *Ovarium* ovoideo-oblongum, 1·5—2 mm. longum, ad apicem sicut styli pilosum, loculis 2—3-ovulatis: styli pilis simplicibus capitatisque admixtis pilosi, stigmatibus viridibus.

Hab. Namaqualand : Among rocks and bushes on a hill-side facing east, 13 miles north of Kamieskroon, *Salter* 2569 (type in Bolus Herbarium) 5565, Bolus 6655, flowers June—July.

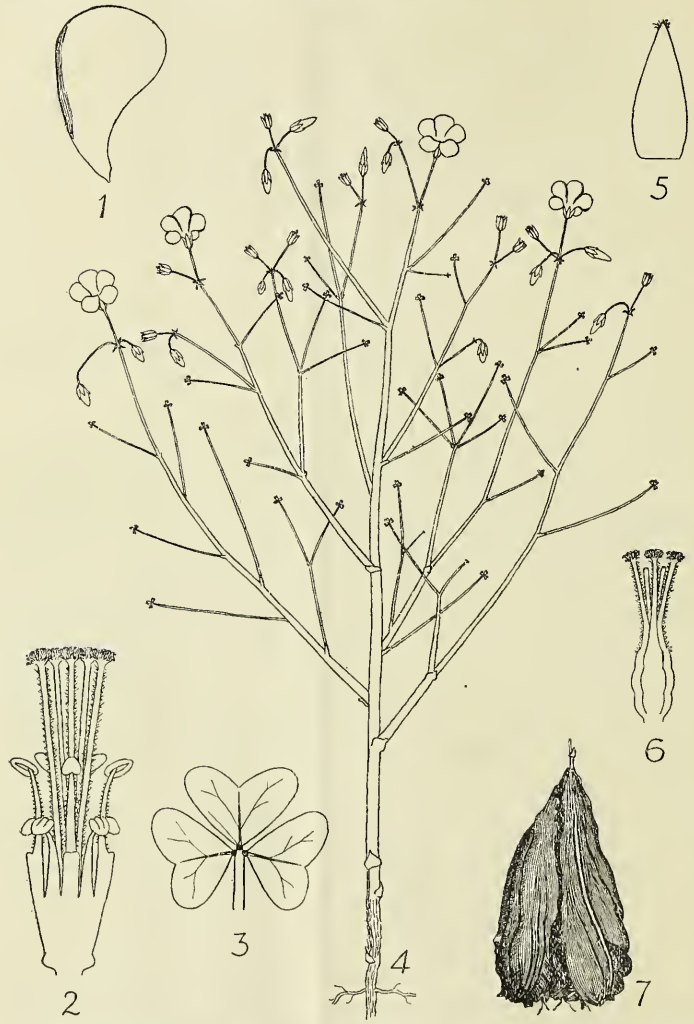


Fig. 1. *Oxalis Knuthiana*, Salter. 1. Petal × 2. 2. Androecium × 8. 3. A leaf fully developed after the flowering period × 3. 4. Plant, half size. 5. Sepal × 4. 6. Gynaecium × 8. 7. Bulb, half size. (*Salter* 2569.) *Del.* T. M. Salter.

A very distinct species owing to its thick succulent stem and branching habit. The plants seemed to be confined to a limited area, some growing in the open and others straggling up through bushes. The former were often somewhat pyramidical in shape and, though flowering freely, the leaflets were minute and undeveloped. Those in the shade, besides the great length of the stem, were less densely branched but larger in all parts including the corolla, some having petals 1·8 cm. long and in these the leaflets had begun to develope. In cultivation leaflets have been produced up to 9·5 mm. long and 11·5 mm. broad after the flowering period. The bulbs were invariably found *under* large stones and in contact with them, and imbedded in a thick mass of old tunic scales.

It undoubtedly belongs to the Section Cernuae and seems to be an affinity of *O. Schaferi*, R. Knuth, but Dr. R. Knuth, to whom I am indebted for making a comparison between *Salter* 5565 and his type of *O. Schaferi*, informs me that they are not the same species. *O. Knuthiana* is evidently larger and the leaflets are broader in proportion to their length and less deeply lobed. The plant illustrated (half size in Fig. 1 is rather smaller than the average of those growing in the open. I have named it in honour of Dr. R. Knuth, in commemoration of his colossal work on the genus Oxalis throughout the world. (Pflanzenreich IV. 130.) (v.v.s., v.v.c.)

Oxalis leptogramma, Salter (Oxalidaceae), § Lineares.

Planta gracilis, caule exserto, 5—12 cm. alta. *Bulbus* late subuloideus, apice acutissimus, 3—4 cm. longus: tunicae lanceolatae vel ligulatae attenuato-aciculares, nitentes, brunneae, exteriores pilis cupreis retrorsis praecipue ad basin apicemque pilosae. *Caulis* gracilis rigidus, ad 7 cm. longus, minutissime viscoso-pilosus, rubro-brunneus, squamis vel foliis abortivis sparse instructus. *Folia* ad 12, vel rare numerosa, apice caulis aggregata vel ad apicem satis dense imbricata, glabra vel rare sparse pubescentia: petioli filiformes, saepe 2 cm. longi, rubro-brunnei: foliola 3, sessilia, anguste linearia, conduplicativa vel involuta, emarginata, interdum levissime falcata, infra lineis punctisque numerosis pellucidis (in sicco atris) notata. *Pedunculi* uniflori, apicales vel rarius e squamorum caulinorum axillis exorientes, folia paulum superantes, rubescentes, prope apicem bibracteati bracteis parvis subulatis, sicut foliola, lineolatis. *Sepala* anguste ovata vel obovata, acuta, in dimidio superiore crispato-ciliata, lineis pellucidis (in sicco atris) longitudinaliter striata. *Corolla* 1·6—1·9 cm. longa, cupreo-rosea vel purpureo-rosea, tubo luteo: petala e basi breviter attenuato-unguiculata oblique obovata, 8—10 mm. lata, margine exteriore sicut foliola lineolata. *Filamenta*

(parte connata inclusa) exteriora 2—3 mm., glabra, interiora 3—5·5mm. longa, glanduloso-pilosa, longissima inaequalia, interdum leviter gibbosa. *Ovarium* anguste ovoideum, ad 1·5 mm. longum, superne pubescens et in sicco nigro-callosum, loculis 2—3 ovulatis, stylis inferne pubescentibus, superne glandulosis. *O. Burkei*, Sond., *var. multiglandulosa* (*Flora Capensis*, vol. I, p. 320.)

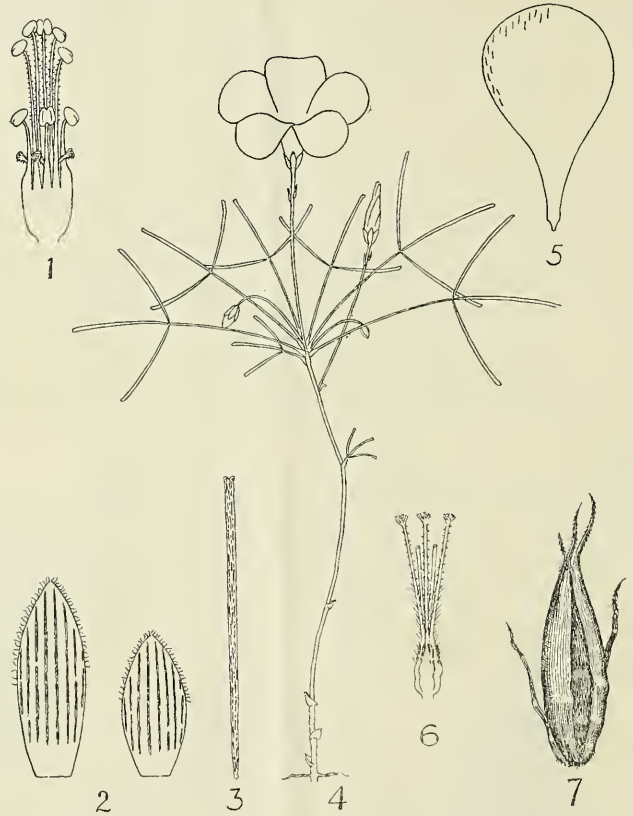


Fig. 2. *Oxalis leptogramma*, Salter. 1. Androecium × 6. 2. Sepals (dried) × 10. 3. Leaflet (dried) × 3. 4. Plant, natural size. 5. Petal × 2. 6. Gynaecium × 6. 7. Bulb, natural size (*Salter* 2178). *Del.* T. M. Salter.

Var. β **brevifolia.** *Caulis* brevior : folia multo breviora. *Corolla* roseo-purpurea vel alba : petala angustiora.

Var. γ **lutea.** *Caulis* brevis : folia breviora. *Flores* folia valde superantes. *Corolla* lutea : petala subcuneata, inferne leviter attenuata.

Hab. Cape Province : Worcester Div. ; near Orchard Station, *Salter* 2178 (*type*) 6045 ; near Brand Vlei, 6040 : Driekop, near Pinaar's Kloof, Zey. 256 ! ; near Berg River,* *Zey.* 252 ! both in Sonder's Herbarium ; *Leipoldt*, Bolus Herbarium 19716, 19717, 19719, 20117, flowers May—June. β (rose-purple) Quarri Siding, *Salter* 2208 (type), 6052 ; Foot of Hex River Pass 6047 ; (white) near Constable Station 2203 ; Pinaars Kloof, 6066. γ Near Montagu, *Salter* 2316 (type), 2321, 6076. *Stokoe*, Bolus Herb. 20120. The types are in the Bolus Herbarium.

This species is one of the group referred to in the key on pp. 11 and 12, vol. II of this Journal and has hitherto been known as *O. Burkei*, Sond., var. *multiglandulosa*, the varicty having been wrongly founded by Sonder on *Zey.* 256 and 252. These plants are however an entirely different species from *O. Burkei*, Sond. (Zey. 257!) which has an ovoid bulb with light brown glabrous papyraceous tunics and is without the pellucid streaks which characterise *O. leptogramma* and its affinities. Sonder's error is perhaps excusable for the two species grow in the same neighbourhood, are superficially very much alike and Zeyher's specimens, particularly those in Sonder's own herbarium are starved, wretched and *without bulbs*. The name *leptogramma* should therefore be substituted for *Burkei* in the key referred to above.

There appear to be three distinct forms. Vars. β and γ approach very nearly to *O. pardalis*, Sond. (*Zey.* 253 !), again pitifully poor material, and its yellow form (*Salter* 6042), differing only in having apical, more or less imbricated petiolate leaves, as opposed to subsessile cauline leaves and suggest that they are a link between the sections *Lineares* and *Sessilifoliatae*, The region in which they grow is, apart from the main road, somewhat difficult of access and it is possible that intermediate forms occur.

Oxalis stictocheila, Salter (Oxalidaceae), § Lineares.

Planta gracilis, caule exserto, 5—12 cm. alta. *Bulbi* saepe 1·5 cm. longi, seniores globoso-ovoidei, juniores angustiores, apice attenuati vel subrostrati : tunicae subrigidae, atrobrunneae, interdum sparse pilosae, juniores tenuiores et pallidiores, saepe leviter undulatae. *Rhizoma* gracile, pallidum, 6—12 cm. longum., squamis minutis amplexicaulibus indutum. *Partes herbaceae* (nisi tamen sepala) glabrae. *Caulis* satis rigidus 1—6 (saepe 2—3) cm. longus, squamis amplexicaulibus 1—2 vel rare foliis abortivis instructus. *Folia* 4—10, caulis apice aggregata :

* The Berg River referred to here by Zeyher and under *Zey* 248, both *O. Zeyheri*, Sond. and *O. Mundtii*, Sond., is probably not the Great Berg River flowing through Paarl and past Piquetberg, but a local name which he obtained for one of the streams rising in the Bonteberg mountains.

petioli filiformes, 1—3 cm. longi : foliola minute petiolulata, lanceolato, oblonga, semiconduplicativa, leviter falcata, minutissime emarginata-saepe 1—1 ·5 cm. longa, apice minute bicallosa, marginibus extremis lineis angustis aurantiaco-pellucidis (in sicco atris) ornata. *Pedunculi* uniflori, plerumque folia superantes, post anthesin deflexi, prope apicem bibracteati bracteis parvis subulatis callosis, sparse ciliatis. *Sepala* lanceolata, 4 ·5—6 mm. longa, ciliata, apice callis 2 vel rare 4 ornata.

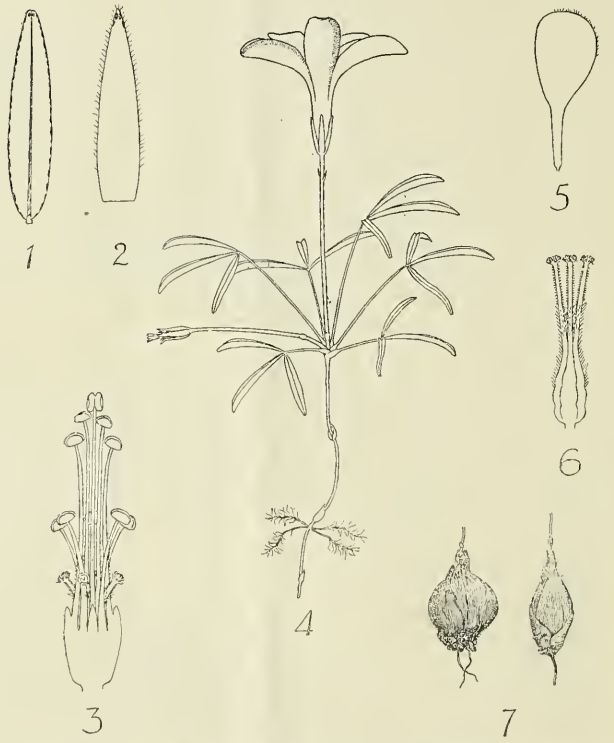


Fig. 3. *Oxalis stictocheila*, Salter. 1. Leaflet, under side (dried) × 2. 2. Sepal × 5 3. Androecium × 6. 4. Plant, natural size. 5. Petal, natural size. 6. Gynaecium × 6. 7. Bulbs, natural size. (*Salter* 6147.) *Del.* T. M. Salter.

Corolla 2—2 ·8 cm. longa, alba, tubo anguste infundibuliforme luteo : petala, e basi unguiculata, obovata 7 ·5—10 mm. lata, nunc purpureo-marginata nunc obscure luteo-marginata, antice margineque exteriore saepe minute ciliata. *Filamenta* (parte connata inclusa) exteriora 3—4 ·5

mm., glabra, interiora 5—7 mm. longa, in dimidio inferiore glandulosa, breviter dentata. *Ovarium* 1·5 mm. longum, in dimidio superiore pubescens, loculis 3-ovulatis, stylis inferne pubescentibus, superne dense glandulosis.

Hab. Cape Province: Malmesbury Div.; plentiful between Darling and Yzerfontein, *Salter* 6147 (*type* in Bolus Herbarium), 2407, flowers June—July.

The chief distinguishing characters in this species are (i) the row of very narrow pellucid orange streaks around the extreme margins of the leaflets, which taper distinctly towards the apex, and (ii) the sparsely pilose bulb tunics, the latter, however, not being an entirely constant feature.

It has various characters in common with the four following species, but, in addition to the distinctive characters already mentioned, these species differ from *O. stictocheila* as shown below :—

O. versicolor, L. has more rigid bulb tunics, glandular hairs or soft pubescence on the peduncle and sepals and much more conspicuous calli.

O. falcata, Sond. has more rigid bulb tunics, silky leaflets and the sepals are attenuate or tapering to the apex in a regular wedgelike manner.

O. polyphylla, Jacq. has much thinner (or sometimes gummy) bulb tunics and very conspicuous apical calli on the narrow leaflets.

O. levis, Salter is a much smaller plant with edentate inner filaments.

Oxalis microdonta, Salter (Oxalidaceae), § Oblongae.

Planta parva ad 8 cm. alta, caule non exserto. *Bulbus* anguste ovalis, apice basique attenuatus, vix 2 cm. longus, tunicis satis rigidis atro-brunneis. *Rhizoma* ad 20 cm. longum, tortuosum, cortice tenue brunneo obtectum. *Folia* 2—5, basalia, petiolis tenuibus rubro-brunneis, 2—3 cm. longis, sicut pedunculi sparsissime pilosis: foliola sessilia, lineari-oblonga vel elliptico-oblonga, 2·5—2·8 cm. longa, 3—4·5 mm. lata, obtusa, minute emarginata, minute denticulato-ciliata pilis subsetaceis hyalinis, nunc patentibus nunc in superficie superiore introflexis. *Pedunculi* uniflori, 3—5 cm. longi, ad apicem vel in parte superiore bibracteati bracteis alternantibus subulatis, ad 4 mm. longis. *Sepala* lanceolata, 6—7 mm. longa, sparse hirsuta, ciliata. *Corolla* 2·0—2·6 cm. longa, violacea, tubo subcylindrico luteo: petala e basi anguste unguiculata in dimidio superiore oblique obovata, ad 9·5 mm. lata, glabra. *Filamenta* (forma brevistylosa solummodo visa) (parte connata inclusa) exteriora 6 mm. longa, late diffusa, glabra, interiora 6 mm. longa, erecta, glandulosa, antheris sagittatis. *Ovarium* fere 1·5 mm. longum, in

dimidio superiore villosum, loculis 4—5-ovulatis, stylis inferne villosis, superne glabris.

Hab. Cape Province : on a hill-side about one mile east of Montagu in shade of bushes on a slope facing south, *Salter* 2318 (*type* in Bolus Herbarium) and 1047 (cult). Flowers May—June.

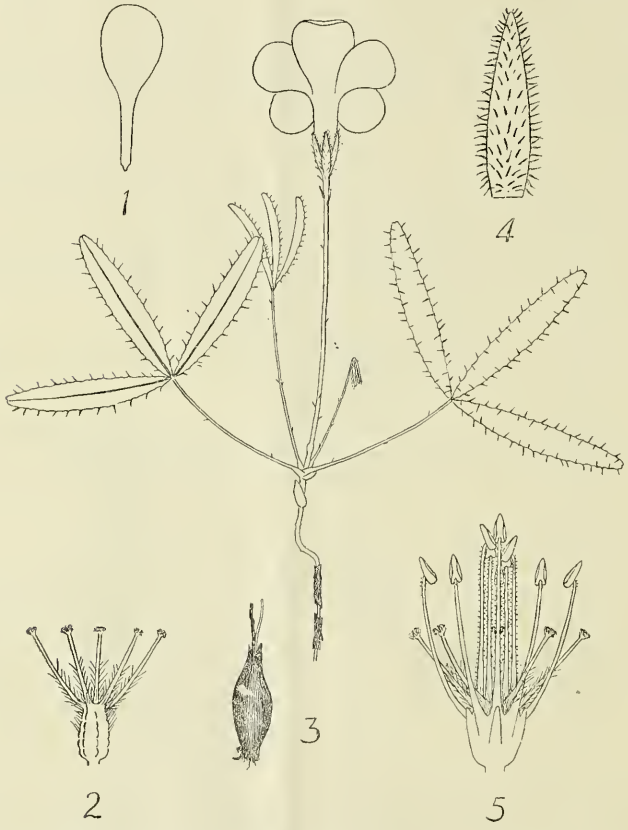


Fig. 4. *Oxalis microdonta,* Salter; 1. Petal, natural size. 2. Gynaecium × 5. 3. Plant and bulb, natural size. 4. Sepal × 4. 5. Androecium ×5. (*Salter* 1047.) *Del.* T. M. Salter.

This plant belongs to a distinct natural group in which *O. purpurea*, Thunb. is the best known species. This group is characterised by the longish subcylindrical corolla tube, by the peculiar arrangement of the

stamens and styles, which, except in the case of the *longest* organs, whether stamens or styles (which are erect), spread out widely when released from the corolla tube, and by the somewhat sagittate anthers. The bulbs except in *O. fibrosa*, Bolus f. and this species are either minute as in *O. minuta*, Thunb. or ovoid with soft lightish brown papery tunics.

Little observation has hitherto been made of the floral characters of the South African Oxalis in relation to their natural groups and it will be as well to give here the following list of published species which fall into this group :—

O. purpurea, Thunb.
O. minuta, Thunb.
O. nidulans, E. and Z.*
O. denticulata, W-Dod. (rubra).
O. fibrosa, Bolus f.
O. Bolusii, R. Knuth.
O. bifolia, E. and Z.
O. approximata, Sond.
O. Eckloniana, Presl.
O. salmicolor, Schltr.

but the group is exceedingly complex and a bewildering number of new forms, intermediates, etc., is constantly coming to light.

. *O. microdonta* is, however, a well marked species and is probably nearest to *O. approximata*, Sond., from which it differs in the marked, though minute, scalloping and ciliation of the leaflets (more pronounced than in *O. nidulans*, E. and Z., in which the ciliation is deciduous) and from all others in the group in its deep bulb and long corticate rhizome (v.v.s., v.v.c.).

Oxalis rubro-punctata, Salter (Oxalidaceae), § Rotundatae.

Planta parva, caule non exserto, 2—3 cm. alta. *Bulbus* ovoideus vel demum subglobosus, longe attenuato-acutus, ad 3 cm. longus : tunicae imbricantes, atro-brunneae, apice pilis adscendentibus brunneis villosae. *Rhizoma* fere 7 cm. longum, saepe rubescens, squamis parvis semiamplexicaulibus indutum. *Folia* 2—6, basalia, petiolis teretibus, 1—2 cm. longis, sparse minutissimeque pilosis, atro-viridis, basi (infra articulum) valde dilatatis : foliola 3, sessilia, rotundata, ad basin leviter cuneato-attenuata, emarginata (lateralia interdum integra), 4·5—9 mm. longa, 6—11 mm. lata, utrinque glabra, supra atro-viridia, infra saturate purpurea, punctis minutis numerosis rubro-pellucidis notata. *Pedunculi* uniflori, 2—4 mm. longi, post anthesin deflexi et paulo elongati, sicut petioli pilosi, rubescentes, prope basin bibracteati : bracteae oppositae, lanceolatae, conduplicativae, fere 3 mm. longae, ad basin ciliatae, callis elongatis aurantiacis conspicue ornatae. *Sepala* anguste ovata interdum acuta, 4—5·5 mm. longa, glabra vel sparse pubescentia, ciliata, ad

* The following species are in my opinion synonymous with *O. nidulans* :— *O. denticulata*, W-Dod (pars alba), *O promontorii*, R. Knuth and *O. Schlechteri*, (Schinz) ex R. Knuth.

marginem callis numerosis oblongis aurantiacis notata. *Corolla* 2·5—3·5 cm. longa, alba, tubo infundibuliforme luteo : petala e basi unguiculata cuneato-obovata, subtruncata, 1·2—1·7 cm. lata, ad marginem exteriorem conspicue violaceo-maculata. *Filamenta* (parte connata inclusa) exteriora 3—4·5 mm., glabra, interiora 4·5—7 mm. longa, sparse minuteque pilosa, dentibus acutis 0·5—0·8 mm. longis instructa.

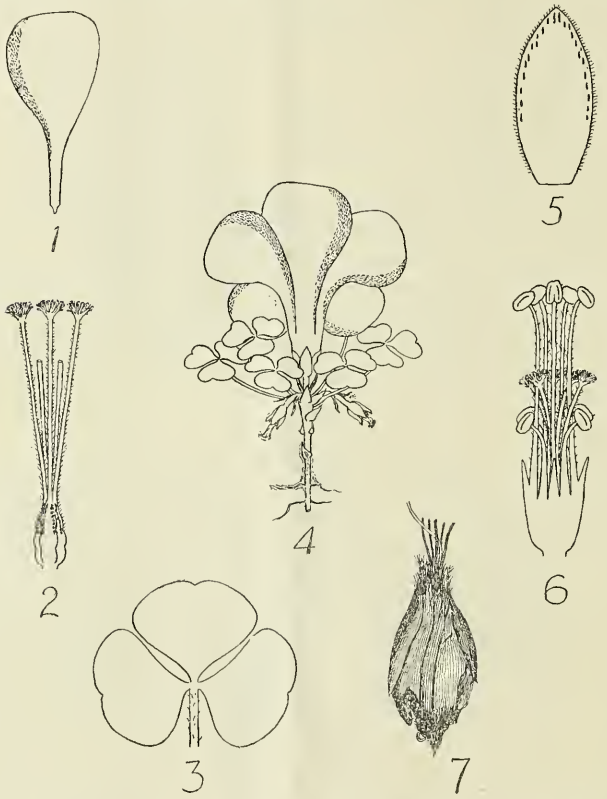


Fig. 5. *Oxalis rubro-punctata*, Salter. 1. Petal, natural size. 2. Gynaecium × 6. 3. Leaf × 3. 4. Plant, natural size. 5. Sepal × 5. 6. Androecium × 6. 7. Bulb, natural size. (*Salter* 5371.) *Del.* T. M. Salter.

Ovarium ovoideo-oblongum, fere 1·7 mm. longum, in parte superiore pubescens et rubro-callosum, stylis inferne pubescentibus, superne glandulosis. *Capsula* globosa, loculis 6-ovulatis.

Hab. Cape Province : Calvinia Div. ; near Bloedzuigerfontein, one mile south of Oorlog's Kloof River Bridge on the Calvinia—Clanwilliam road, 18 May, 1935, *Salter* 5371 (*type* in Bolus Herbarium).

Nearest in affinity to *O. zonulata*, L. Bolus and to those forms of *O. aureo-ciliata*, Bolus f., which are without the typical ciliation on the leaflets. It may be recognised by the soft brown ascending hairs on the apices of the bulb tunics, the callous-margined peduncular bracts and by the inconspicuous dots on the leaflets, which, under magnification (under a strong transmitted light), reveal tiny transparent red centres. I have noticed the latter character in one other species, viz. *O. strumosa*, Jacq. (*O. mutabilis*, Sond., var. α) a softly pubescent species with mottled leaflets, so different in other respects that it cannot be confused.

I have resisted the temptation to give this species a geographical trivial name.

Oxalis minima, Sonder, variety **alba,** Salter (Oxalidaceae), § Rotundatae.

Planta parva glauca, caespitulosa, 2—4 cm. alta, caule non exserto *Bulbi* anguste ovoidei, congesti, tunicis numerosissimis laxe circumdati : tunicae lanceolatae vel lineares, 2—3 cm. longae, atro-brunneae, ad apicem integrae, acutissimae, inferne tripliciter diffissae, segmentis ligulatis vel linearibus. *Rhizoma* fere 8 cm. longum, squamis paucis parvis membranaceis instructum. *Folia* basalia, ad terram adpressa : petioli graciles, 1—2 cm. longi, sicut pedunculi minutissime glandulosi, ad basin (infra articulum) dilati : foliola 3, sessilia, rotundata, ad basin late cuneata, integra vel leviter emarginata, 3—5 ·5 mm. longa, 3 ·5—7 mm. lata, interdum obscure brunneo-punctata, utrinque glabra, supra glauca, minutissime glanduloso-ciliata. *Pedunculi* uniflori, 1—1 ·5 cm. longi, paulo infra apicem bibracteati bracteis parvis pallidis alternantibus. *Sepala* anguste obovata vel rarius ovata, obtusa vel subacuta, 2 ·5—3 ·5 mm. longa, margine nonnihil purpurascentia, in parte superiore callis 6—10 elongatis aurantiacis conspicuis ornata. *Corolla* 1 ·6—2 ·2 cm. longa, alba, tubo infundibuliforme luteo, cum laminis aequante : petala e basi anguste unguiculata superne obovata, 0 ·7—1 ·1 cm. lata. *Filamenta* (parte connata inclusa) exteriora 1 ·3—3 ·5 mm., glabra, interiora 3 ·5—6 mm. longa, minute glanduloso-pilosa, gibbosa, longissima apice rostrata. *Ovarium* oblongum, in dimidio superiore, sicut styli, dense glanduloso-pilosum, loculis 3-ovulatis.

Hab. Cape Province : Van Rhyn's Dorp Div. : 6—7 miles south of Van Rhyn's Dorp, *Salter* 5309 (*type* in Bolus Herbarium), 3334, 5304 ; 7 miles west of Nieuwerust 5348 ; about Bitterfontein 923, 5493 ; *Leipoldt* Bolus Herb. 19703, flowers May—June.

Oxalis minima, Sond. is unfortunately named for it is by no means the "smallest" species. The leaves lie flat upon the ground and, in their natural arid habitat, are a pronounced bluish green, though this character disappears in cultivation in the Cape Peninsula. Variety *alba*,

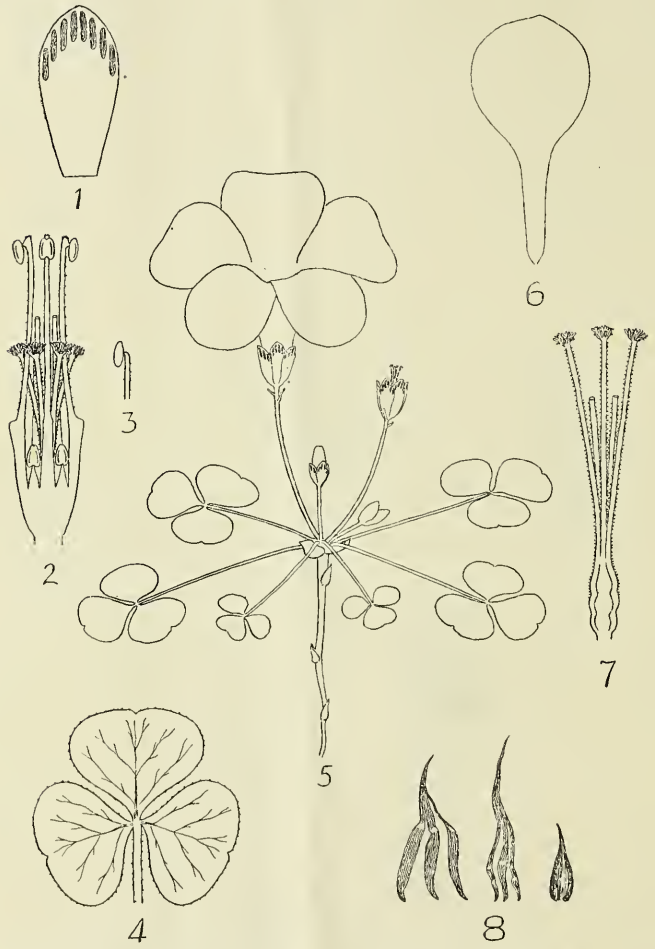


Fig. 6. *Oxalis minima*, Sonder, variety *alba*, Salter. 1. Sepal × 8. 2. Androecium × 8. 3. Apex of long filament in *O. minima*, Sond. 4. Leaf, under side × 4. 5. Plant × 2. 6. Petal × 2. 7. Gynaecium ×8. 8. Bulb and tunics, natural size. (*Salter* 5309.) *Del.* T. M. Salter.

in addition to its white flowers, also differs in that the *longest* filaments are rostrate at the apex like those of *O. monophylla*, L. and *O. petraea*, Salter. The minute glandular hairs referred to in this description are also present in the typical form, but they are very difficult to detect in herbarium specimens unless detached and held up to the light.

This variety is plentiful in the dry country about Van Rhyn's Dorp and Bitterfontein, but it does not occur further north, whereas the typical yellow form, common in Namaqualand, has not been observed south of Kamieskroon. (v.v.s., v.v.c.)

Oxalis monophylla, L., variety **rotundifolia,** Salter (Oxalidaceae) § Simplicifoliae.

Var. nov., ab forma typica ita differt :—*Planta* minor. *Folia* 1—2, petiolis brevioribus ; lamina majora, latiora, suborbiculata, ad basin late cuneato-angustata, nunquam conduplicativa, omnino glabra, margine anguste cartilagineo, supra glauca, post anthesin valde ampliantia, (fere 4 cm. diam.). *Pedunculi* breviores. *Sepala* lanceolata, leviter

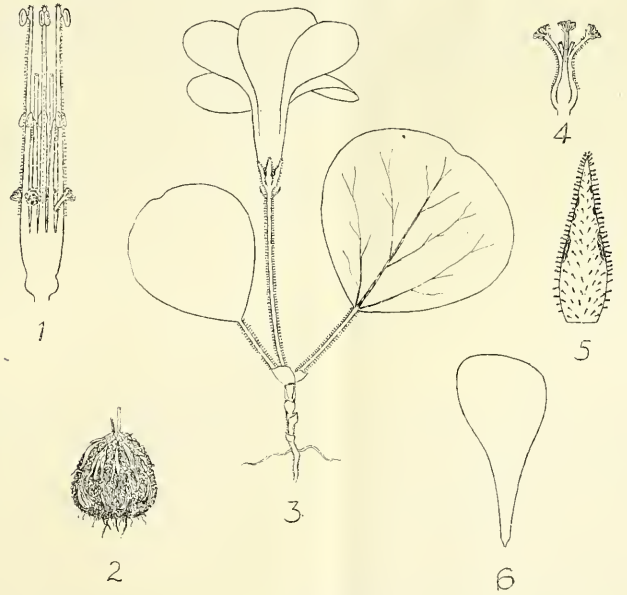


Fig. 7. *Oxalis monophylla*, L., variety *rotundifolia*, Salter. 1. Androecium × 6. 2. Bulb, natural size. 3. Plant × 1½. 4. Gynaecium × 6. 5. Sepal × 6. 6. Petal × 1½. (*Salter* 3332.) *Del.* T. M. Salter.

acuminata. *Corolla* alba. *Filamenta* tenuiora, edentata : antherae minores et luteae pallidiores.

Hab. Cape Province : Clanwilliam Div. ; on a stony bank near Olifants River, 12 miles north of Clanwilliam, *Salter* 3332 (*type* in Bolus Herbarium), 673 and 2601 (leaves after flowering season), also observed 5 miles further north, flowers May—June.

This well marked variety can be at once recognised by its white flowers and almost round glaucous leaves which enlarge to quite double their natural size after the flowers die down, are never conduplicate, and are not ciliate with glandular hairs as in the typical form. (v.v.s., v.v.c.)

Oxalis monophylla, L., variety **minor,** Salter.

Var. nov., ab forma typica ita differt :—*Planta* minor. *Folia* elliptica, emarginata, 0·8—1·5 cm. longa, glauca. *Pedunculi* breviores. *Corolla* alba. *Sepala* anguste ovata, membranaceo-marginata.

Hab. Cape Province : Clanwilliam Div ; in waterlogged sand near causeway on Brandewyns River on Pakhuis—Doornbosch road, *Salter* 2463 (*type* in Bolus Herbarium), 4438, 5392 ; Pakhuis Pass, 4436 and also observed near Pakhuis village, flowers May—July.

This variety is a much smaller and more slender plant than the true *O. monophylla*, and although in the majority of its characters it does not vary so much as var. *rotundifolia* from the typical form, it is very different in appearance and may be at once recognised by its white flowers and small elliptical glaucous leaves. In the three small areas where I have seen it growing, in each case flat ground where water would lie for some time after heavy rain, the plants were abundant and often massed together, but only a small proportion of them were in flower (v.v.s., v.v.c.).

O. monophylla, L., and its varieties are peculiar for their "sponge-like" bulbs. In the numerous plants of the typical form, its variety *stenophylla*, Sonder (both of which have rosy or lilac flowers) and also in the two foregoing varieties, I have invariably found the *longest* filaments rostrate at the apex, i.e., projecting above the anthers (see Fig. 7), a peculiarity which has been observed in a few other species. This character is well illustrated in Jacquin's "Oxalis," *O. rostrata*, Jacq. (tab. 22) which Sonder considered to be *O. monophylla* (Flor. Cap. vol. I, p.318) and I believe quite rightly, but in Jacquin's uncoloured illustration of *O. monophylla*, L. (tab. 79, f. 3) the filaments are shown

without this projection. This drawing, however, was made from a dried plant in Thunberg's collection and it is easy to understand that this minute character could have been overlooked, for, if it is not suspected, it is exceedingly difficult to detect in herbarium specimens, even when dissected. The rostrate filaments are only found in the short- and medium-styled flowers, never in the long-styled form.

Oxalis amblyodonta, Salter (Oxalidaceae), § Multifoliolatae.

Planta satis robusta, pilosa, caule exserto, ad 14 cm. alta. *Bulbus* subglobosus vel ovoideus, saepe 2 cm. longus, tunicis rigidis atro-brunneis. *Caulis* ad 5 cm. longus, dense pilosus, squamis semiamplexicaulibus pilosis instructus. *Folia* 8—20, apice caulis aggregata: petioli subvillosi, ad 3 cm. longi, exteriores breviores, saepe squamiformes: foliola 5—7, sessilia, anguste oblonga vel linearia, plerumque conduplicativa, falcata, obtusa, minute emarginata vel subacuta, 0·6—1·1 cm. longa, 1·5—2 mm. lata, supra glabra, infra villoso-pubescentia, ciliata. *Pedunculi* uniflori, satis numerosi, apicales vel 1—3 e squamorum caulis axillis exorientes folia superantes, pilosi, ad apicem bibracteati: bracteae alternantes lineares pilosae, ad 5 mm. longae. *Sepala* lineari-lanceolata, 8—9 mm. longa, pilosa, ciliata, ecallosa. *Corolla* lilacea, 2·2—2·8 cm. longa, tubo anguste infundibuliforme luteo: petala e basi attenuato-unguiculata superne oblique obovata, ad 1 cm. lata, ad marginem exteriorem inferiorem pubescens et leviter purpurascens. *Filamenta* glabra (parte longe connata inclusa) exteriora 2·7—4 mm., interiora 4·5—9 mm. longa, appendiculis latis irregulariter truncatis dentata, *Ovarium* ovoideo-oblongum, in dimidio superiore dense cano-pilosum loculis 2—3-ovulatis, stylis inferne cano-pilosis, superne glandulosis.

Forma β. *Foliola* 7—10, plerumque 9, linearia, 1·3—1·5 cm. longa, fere 1 mm. lata, manifeste emarginata. *Sepala* angustiora 1·1—1·2 cm. longa. *Corolla* 2·9—3·2 cm. longa, tubo latiore.

Hab. Cape Province: Tulbagh Div.; Bushman's Kop near Gouda, flowers May—July, *Salter* 2279 (*type* in Bolus Herbarium); 6091; Clanwilliam Div.; *Edwards*, Bol. Herb. 21746; Piquetberg Road, *Schlechter*, 7941; ? loc. *Leipoldt*, Bol. Herb. 19733, 19753. β Piquetberg Div.; 2 miles east of Porterville, *Salter* 2612; Clanwilliam Div.; *Leipoldt*, Bol. Herb. 19766; Brackfontein, *Schlechter* 7873 (ex parte).

This species has been confused with both *O. Zeyheri*, Sond. and *O. variifolia*, Steud. It is, however, a much stouter and more densely hairy plant than either and is remarkable for the broad irregularly truncate teeth on the inner filaments and its long slender sepals, generally about one-third the length of the corolla.

A close examination of the type of *O. Zeyheri*, a mountain species (Zey. 248, ex parte) in Herb Sond. (also represented in the Bolus Herbarium) discloses that there are gland-tipped hairs on the herbaceous parts, which apparently escaped Sonder's notice. The plants are starved and were evidently collected in a dry season and without bulbs. Plants which are obviously the same species have been collected by me in the

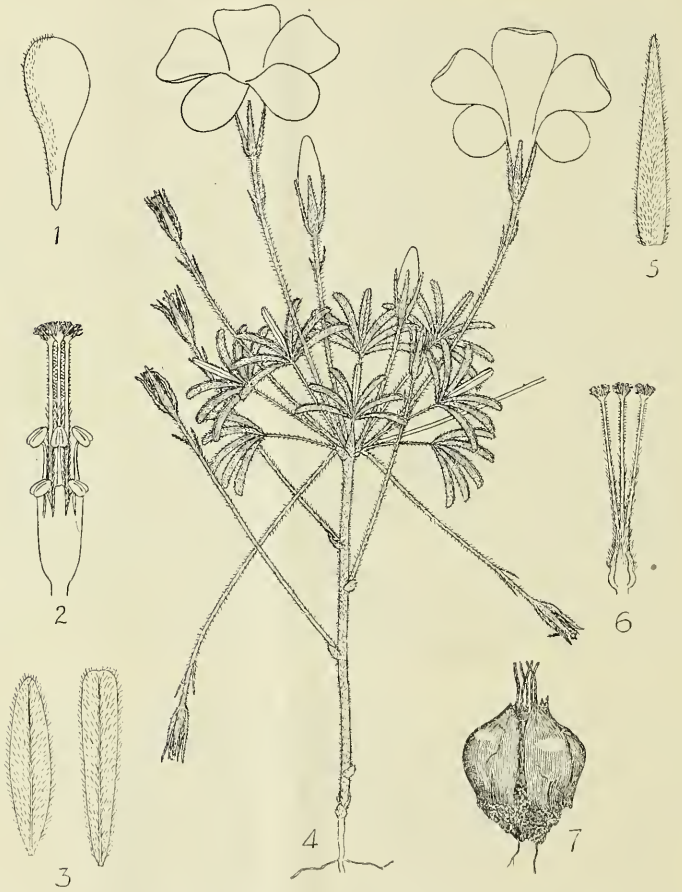


Fig. 8. *Oxalis amblyodonta*, Salter. 1. Petal, natural size. 2. Androecium × 5. 3. Leaflets, under side × 3. 4. Plant, natural size. 5. Sepal × 3. 6. Gynaecium, medio-stylar form × 5. 7. Bulb, natural size. (*Salter* 2279.) *Del.* T. M. Salter.

Hex River District, though my specimens (*Salter* 2191, 2205) are more distinctly glandular. The number of leaflets varies between 5 and 14 and the bulb is broadly subuloid with distinct vertical ridges.

O. amblyodonta is more closley related to *O. variifolia*, Steud. (E and Z 774!), *O. pentaphylloides*, Sond. which is, however, a softly and rather scantily pubescent species, with only 5 leaflets (more rarely 3 or 4) proportionately shorter sepals and narrower teeth on the inner filaments. Although entirely different in structure it seems by its bulb and floral characters to have some affinity with *O. cana*, Sond. I hesitate to name form β as a variety, for the species is geographically somewhat widespread and I suspect that there may be intermediate forms. (v.v.s., v.v.c.)

Oxalis palmifrons, Salter (Oxalidaceae), § Multifoliolatae.

Planta parva, caule non exserto, ad 4 cm. alta. *Bulbus* ovoideus, saepe 4 mm. longus, tunicis subrigidis imbricantibus, apice attenuato-acicularibus, minutissime rugoso-undulatis, atro-brunneis, satis laxe obtectus. *Rhizoma* ad 25 cm. longum, in parte superiore robustum, squamis ovatis semiamplexicaulibus indutum. *Folia* basalia, saepe numerosa, ad terram rosulato-adpressa : petioli compressi, ad 2 cm. longi, 2·3 mm. lati, post anthesin valde elongati, ad basin (infra articulum) alato-dilatati, supra glabri, infra pubescentes, dense ciliati : foliola 20—29, sessilia, digitata, oblonga, omnino conduplicativo-involuta, itaque subcylindrica, 5—7 mm. longa, supra vel intus glabra, infra pubescens, apice minute penicillata, pilis incurvatis (attamen celata) ciliata. *Pedunculus* unicus, uniflorus, 0·5—1·5 cm. longus, sparse pilosus, bibracteatus bracteis lanceolatis carinatis, 4—5 mm. longis, pubescentibus, sepala imbricantibus. *Sepala* ovato-lanceolata, saepe leviter attenuata, circa 6 mm. longa, praecipue in parte superiore hyalino-pilosa et ciliata, ecallosa. *Corolla* 2—3 cm. longa, alba, tubo infundibuliforme luteo : petala e basi oblique unguiculata, obovata, ad 1·3 cm. lata, margine exteriore inferiore plerumque obscure obumbrata. *Filameata* (parte connata inclusa) exteriora 2·5—5 mm., glabra, interiora 5·5—7·5 mm. longa, sparse minuteque glandulosa, latissime truncato-dentata. *Ovarium* late oblongum, ad 2 mm. longum, in dimidio superiore pubescens, loculis 2—3-ovulatis, stylis inferne pubescentibus superne glandulosis.

Hab. Cape Province : Laingsberg Div. : Tweedside, flowers May—June, *Salter* 6053 (*type* in Bolus Herbarium), *Compton* 6250, 3992 (leaves only) ; Ceres Div. : Wolverivier, *Salter* 6063 (leaves only) : Sutherland Div. : Uitkyk, *Marloth* 9737 (leaves only).

Though perhaps nearest to *O. tomentosa*, L.f., this Oxalis has little or no affinity to that or any other species. It may be recognised by its dense flat-lying rosette of palm-like leaves and the large number of its

completely involute (or apparently cylindrical) leaflets, which vary in the specimens seen from 20 to 29 in number. It grows in flat open spaces and the bulbs, which lie at a depth of about 10 inches, in hard

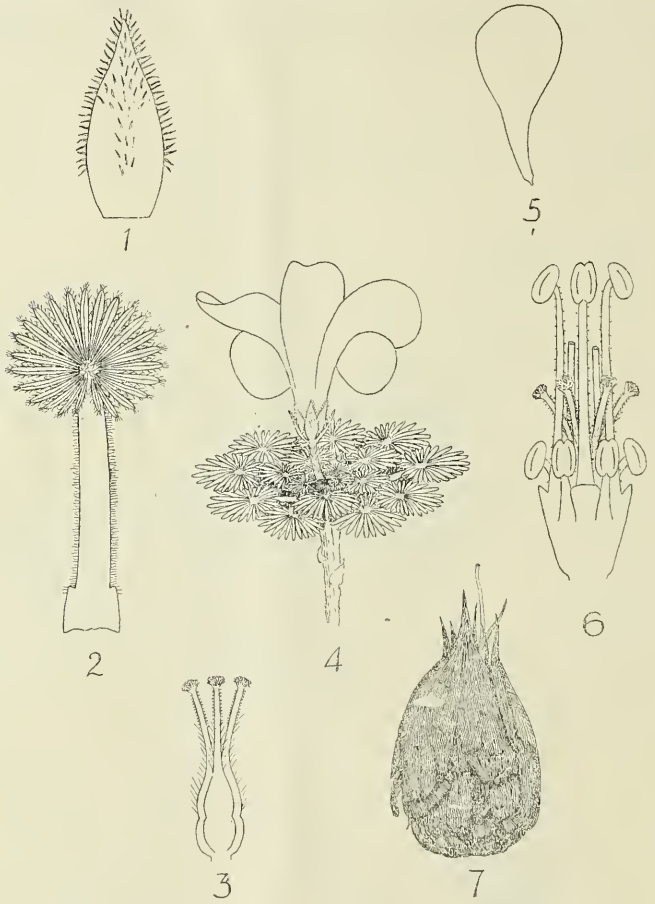


Fig. 9. *Oxalis palmifrons*, Salter. 1. Sepal × 5. 2. Leaf, upper side × 2. 3 Gynaecium × 6. 4. Plant, natural size. 5. Petal, natural size. 6. Androecium × 6. 7. Bulb, natural size. (*Salter* 6053.) *Del.* T. M. Salter.

clayey soil, are usually embedded amongst stones and are for that reason often flattened and misformed. It appears to flower but rarely, and when it does so, the flowers usually appear before the leaves have developed.

At a later stage the petioles lengthen considerably, in some specimens (*e.g.*, *Compton* 3992) the rosette of leaves is 12 cm. in diameter. I am informed by Mr. J. Logan that it also occurs near the memorial about 5 miles west of Matjesfontein and it is probably fairly plentiful in the regions to the eastward of the Bonteberg mountains. There is a notation written by the late Dr. R. Marloth on the ticket in his herbarium (9737) "Sopzuring" used for soup.

Buttonia superba, Obermeijer (Scrophulariaceae-Gerardieae).

Affinis *B. natalensi* sed differt bracteolis anguste spathulatis, minoribus, floribus aliquanto maioribus et calice frutescenti.

Woody creeper. *Stems* shortly tawny pubescent becoming glabrous with age. *Leaves* opposite, pinnatifid usually with 2 lateral pinnae and an apical one; pinnae with a few irregular coarse teeth, cuneate at the base, minutely puberulous. Petiole ± 2·5 cm. long. *Flowers* axillary, solitary, massed in the upper part of the stems. Peduncle 2—4 cm. long, wiry. Bracteoles small, narrow spathulate, variable in size, up to 10 × 3 mm., deciduous. *Calyx* campanulate ± 2·5 cm. long; lobes triangular, ± 6 mm. long, tips tawny-puberulous, in fruit reticulate, as a consequence of the softer tissues disappearing and the anastomosing nerves persisting. *Corolla* about 6 cm. long; tube 4 cm. long, cylindrical in the lower half, suddenly dilated and ventricose in the upper half, ± 2·5 cm. in diameter at the throat; lobes broadly rounded ± 2·5 × 2·5 cm. Stamens in 2 pairs inserted above the cylindrical part of the tube; filaments of upper pair ± 1·5 cm. long, polliniferous cells ± 5 mm. long, the empty ones longer and vermiform; filaments of lower pair 2 cm. long, empty pollen cells absent. Style exserted ± 3 cm. long. *Capsule* thinly woody, hidden by the calyx, ± 1.5 cm. long. Seeds 3 mm. long, angular, alveolate, straw-coloured.

Loc. Transvaal. Pilgrims Rest district; road from Ohrigstad to Brandraai, mountain slopes, scrambling on shrubs, 5 ft. high, *R. G. N. Young*, A 575, syn-type. Nooitgedacht Mountain near Brandraai, northern kloof, climbing on trees in forest. *R. G. N. Young*, A 664, syn-type. Flowering and with fruits November, 1933. (In the Transvaal Museum Herbarium, Pretoria.)

This third species of *Buttonia* is closely related to *B. natalensis* McKen, but easily distinguished from it by the small, narrow spathulate bracteoles and the somewhat different and larger calyx. The corolla, too, seems somewhat larger in our species. From the other species, *B. Hildebrandtii* Engl.* of East Africa, it differs in the leaf shape and the much larger

* Engl. Jahrb. XXIII, 509, Plate XI, A-C. 1896. The bracteoles were omitted from the drawing.

flowers, while the bracteoles are situated close to the calyx (in *B. Hildebrandtii* they are remote).

Rhoicissus magalismontana, Obermeijer (Vitaceae).

Affinis *R. digitatae* (L.f.) Gilg et Brandt sed foliolis petiolulatis, inflorescentia multiflorifera et fructu tomentoso.

A huge liane. *Stems* flexible, rope-like up to 30 M. and more in length and 12 cm. in diameter, rugose with large protruding lenticels ; young branches smooth. Leaves trifoliolate, silvery pubescent when young, eventually glabrous, nerves prominent. Petiole 1—2 cm. long. Leaflets with ± 5 mm. long petiolules ; terminal leaflet obovate, 6 × 2·5 cm., apex acuminate or sometimes obtuse, base cuneate tapering into the petiolule ; lateral leaflets somewhat smaller, lanceolate, slightly unequal sided. *Inflorescence* cymose dense, many flowered, sessile or almost so, rufous pubescent ; pedicels 1 mm. long ; bracts small, triangular, reddish. Calyx cupular, lobes triangular, small. Petals 5, ovate, 1 mm. long, fleshy, somewhat hirsute on the back. Fruit 1 cm. in diameter, rufous tomentose.

Loc. Transvaal : Brits district, Magaliesberg range, Jacksonstuin in the large kloof, *Obermeijer*, T.M. 30957, type ! (Transvaal Museum) flowering October, 1932.

Vernonia umbratica, Obermeijer (Compositae-Vernonieae).

Frutex ramosus ; rami strigosi.* Folia supra sparse pilosa, subtus pallidiora, minute glandulosa et sparse pilosa, lamina lanceolata vel ovata, 10—15 cm. longa, 2—5 cm. lata, apice longe acuminata ; basi in petiolam attenuata, margine irregulariter dentata. Corymbi terminales, circ. 9 cm. diam., circ. 20-cephali, pedunculo 1—5 cm. longo. Capitula circ. 20-flora, 10 mm. longa, 8 mm. diam., pedicellata ; pedicelli 4—8 mm. longi strigosi, bracteati ; bracteae parvae. Involucrum campanulatum, 4 mm. longum squamis sub-2-seriatis ovatis apiculatis strigosis glandulosis ; squamae exteriores multi breviores ; receptaculum paulum foveolatum. Pappi setae 5 mm. longae scabrae, exteriores multi breviores. Corolla 7 mm. longa glandulosa et extus sparse hirsuta. Ovarium hirsutum ; rami stigmatici extus hirsuti. Achaenia 3 mm. longa setosa, pilis erectis albis dense aureo-glandulosa, glandulis sessilibus, indistincte 5-angulata ; callus basalis distinctus.

Loc. Transvaal : Lydenburg district, Mariepskop, *van Son*, T. M. 30681, type, flowering April, 1932. Pietersburg district, Woodbush,

* The hairs on the stems as seen when enlarged are T shaped with a short stem and long arms.

Wager, T.M. 23073 ; Thabina, *Rogers* s.n. (T.M. 15913). Zoutpansberg district, Zoutpansberge, Entabeni, *Obermeijer*, T.M. 30130, spreading shrub leaning on bushes in forest undergrowth, common, flowers purple, flowering and fruiting November, 1931. Barberton, *Janse*, T.M. 10004. Natal : Krantzkloof *Rogers* 24693. (All in the Transvaal Museum, Pretoria.)

The above species appears to belong to the section *Cyamopsis*. It is not nearly related to any of the South African species so far described.

Sphaeranthus (§ Eusphaeranthus) **gazaensis** Bremekamp. (Compositae-Asteroideae).

Herba annua, erecta, ramosa, 28 cm. alta, glandulosa pilosaque, ramis adscendentibus in parte veteriore stramineus, distincte sed anguste alatis, alis in parte superiore ramosum, dentibus spinulosis munitis in parte inferiore integris. *Folia* usque ad 4·5 cm. longa et 1·2 cm. lata, plerumque minoribus, sessilia, oblonga, penninervia, nervis lateralibus leviter adscendentibus, plerumque vix distinctis, apice acuta, longe spinuloso-mucronata, margine dentata, dentibus spinulosis, basi semi-amplexicaulia et in alis spinuloso-dentatis an integris decurrentia. *Glomeruli* numerosi, terminalis, plerumque longa pedunculati, globulares, 1 cm. lati et longi, haud distincte involucrati, receptaculo communi globulari, cavoque ; pedunculi necnon alati, teretes, usque ad 3 cm. longi. *Capituli* numerosi, bracteis linearibus, longe spinuloso-mucronatis, pilosis, non-glandulosis, involucro squamis 8, gracilibus, linearibus an filiformibus in dimidio superiore pilosis, spinulosis mucronatis an plerumque obtusis. *Flores* ♂ ♀ 2—3 pro capitulo, corolla cylindrica in dimidio inferiore angustata ad apicem glandulosa, ovario gracili, glabroque probabiliter sterili. *Flores* ♀ circiter 9, sessiles, corolla gracilis filiformi, glaber, ovario pubescente.

Loc. Portuguese East Africa :—District Guiya, along the Limpopo River, July, 1915, *Gazaland Expedition*, T.M. 15763 (Transvaal Museum). Related to *S. indicus*, L., *S. senegalensis* DC and *S. kalachariensis*, Bremekamp and Obermeijer, but distinguishable from the latter by the spinulose margin of the leaves, the wings along the stem and the smaller number of flowers ; from the two others by the wingless peduncle ; from *S. indicus*, L. moreover by the pubescent ovary of the ♀ flowers and the form of the corolla in the ♂ ♀ flowers ; from *S. senegalensis* DC by the nature of its pubescence.

Corymbium laxum, Compton (Compositae—Vernonieae).

Rhizoma breve repens, pilis longis lanosis mollibus dense obtectum. *Folia* numerosa, erecta, simplicia, e base leviter dilata scariosa linearia,

FIG. 10. *Corymbium laxum* Compton. Plant × ½. 1. Portion of panicle × 2. 2. Single capitulum × 2. 3. Flower with involucre removed × 2. 4. and 5 Involucral bracts × 2. 6. Style with pappus attached to apex of achene × 4. 7. Transverse section of leaf × 8. 8. Two anthers from outside × 4. 9. Portion of pappus × 8. 10. Outer involucral bracts × 4. (*Compton* 6190.) *Del.* W. F. Barker.

coriacea, glabra infra convexa, supra concava, venis non prominentibus, in sicco canaliculata, long. 12—25 cm., lat. 1·5—3 mm., apice acuto. *Inflorescentia* erecta, laxa, subsecunda, folia paulo excedens, 3—4-ramosa, ramulis ultimis capillaribus. *Pedunculus* leviter angulatus, rubidus, glaber, flexuosus, plerumque bract as vacuas distantes 1 vel 2 gerens. *Bracteae subtendentes* gradatim imnores, ultimae subulatae, long. 3 mm., pilis paucis longis marginalibus basalibus. *Capitula* solitaria, uniflora, patentia vel nutantia. *Bracteae involucrales exteriores* 3, coriaceae, ovatae, ad apicem subfimbriatae, long. 2 mm., interiores amplectentes ; *interiores* 2, coriaceae, erectae, oblongae, purpureae, glaucae, ad apicem fimbriatae, marginibus scariosis, circum florem inter se amplectentes, long. 9—11 mm., lat. 2·5 mm. *Ovarium* long. 5 mm., pilis albis sericeis longis erectis dense obtectum. *Pappus* 1-seriatus, setis numerosis rigidis erectis, ad basin connatis, long. 1 mm. *Corolla* purpurea, tubo angusto long. 4 mm., lobis oblongo-ellipticis, long. 7 mm., lat. 3 mm., late patentibus, venis submarginalibus conspicuis. *Antherae* long. 4 mm., ad basin sagittatae. *Stylus* infra glaber supra et in superficiem stigmatum exteriorem papillosus.

Loc. Cape Province, Clanwilliam Division, Cederberg Sneeuwkop, 5500 ft. alt. 12 February 1936. *Compton* 6190 (type).

The genus Corymbium is noteworthy among Compositae in several respects. The plants have a very " monocotyledonous " appearance, possessing short subterranean rhizomes and linear leaves with parallel venation. The capitulum consists of a single typical tubular floret surrounded by an involucre of very few parts (two or three small outer bracts and two longer inner ones). The reduction in size of the capitulum is compensated for, biologically speaking, in most species by the massing together of the numerous capitula of one inflorescence in a conspicuous corymbose cluster, whence is derived the generic name. In this respect, however, *C. laxum* is distinct from all other species, the inflorescence being a loose panicle, and the generic name becoming a misnomer. The solitary flowers are conspicuous through the bright colour of their relatively large spreading corolla segments. The whole aspect of the plant is as distinct from that of the " typical Composite " as could be imagined.

Other features of *C. laxum* to which attention may be called are the sagittate anthers and the papillose covering of the upper portion of the style as well as the outer surface of the stigmas.

The plant is fairly abundant on the upper slopes of the Cederberg Sneeuwkop, but only a few specimens were seen in flower : it is possible that general flowering may only occur in the season after a bush fire, as in the case of other species of the genus.

Selago oresigena, Compton. (Selagineae.)

Fruticulus erectus densus. *Caules* teretes, glabri, foliorum cicatricibus persistentibus. *Folia* numerosa, imbricata, ereeto-patentia vel patentia, coriacea, glabra, anguste lanceolata, integra, long. 5—8 mm., lat. 1—1·8 mm., apice paulo inflexo, marginibus paulo reflexis, mesoneuro obscuro. *Inflorescentia* spiciformis, brevis, terminalis, long. 1·5—3·0 em., diam. e. 1·2 em. *Bracteae* elliptieae, obtusae, long. 4 mm., lat. 1·5 mm , supra glabrae, infra sparse pilosae. *Calyx* long.

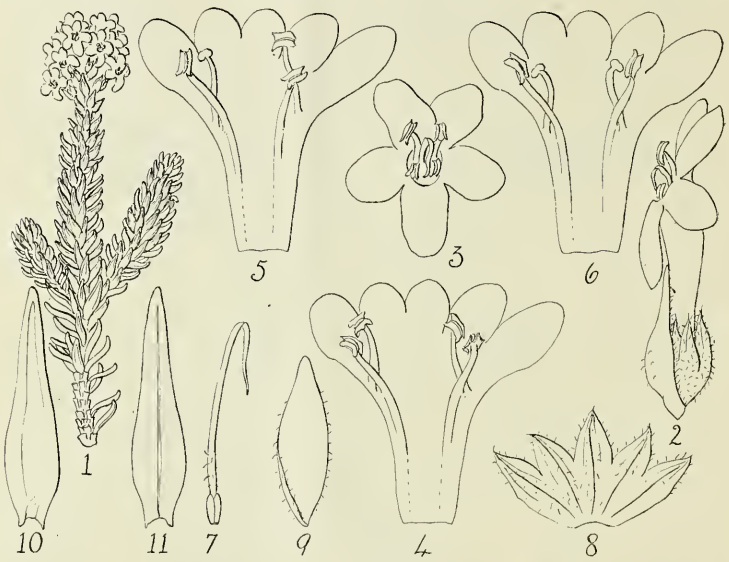


Fig. 11. *Selago oresigena* Compton. 1. Branch, natural size. 2. Flower, side view. 3. Flower, front view. 4. Corolla, with 4 stamens. 5. Corolla, with 3 stamens and 1 staminode. 6. Corolla, with 2 stamens and 2 staminodes. 7. Gynaecium. 8. Calyx, laid open, from outside. 9. Bract, from outside. 10. Leaf, lower side. 11. Leaf, upper side. All × 5. (*Compton* 4626.) *Del.* W. F. Barker.

2·5 mm., externe sparse pilosus, segmentis 5 acutis, tubo aequantibus. *Corolla* alba, tubo long. 5 mm., supra quam infra paulo latiore, segmentis rotatis subaequalibus, long. 1—1·5 mm. *Antherae* paulo exsertae, omnes plerumqu fertiles, interdum 1 vel 2 steriles. *Stylus* long. 5 mm., stigmate simplice.

Loc. Cape Province, Tulbagh Division, Great Winterhoek, 6,000 ft. alt., 6 December 1896, *A. Bolus ;* 6,500 ft. alt., 14th February 1934,

Compton 4626 (type): Clanwilliam Division, Cederberg Sneeuwkop, 6,300 ft. alt., March, 1932, *Stokoe* 2603; 6,000 ft. alt., 12 February, 1936, *Compton* 6342.

This new species of Selago is related to *S. glutinosa* E. Mey., etc. It is apparently confined to high mountain summits, not having been collected below 6,000 ft. It exhibits an interesting tendency towards reduction of some of the anthers to sterility: this was well marked in *Compton* 4626 though in *Compton* 6342 examination of 27 flowers showed no instance of anything less than four perfect anthers. The genus Gosela Choisy was distinguished from Selago mainly on the basis of the presence of two fertile stamens and two staminodes. I examined specimens of *Gosela Eckloniana* Choisy at Kew and in the South African Museum (*Ecklon* 123, *Ecklon and Zeyher* Pikinierskloof, and *Zeyher* 3554 Kardouw) and found the staminodes as described. My new species should certainly be included in Selago, but the tendency to sterility of some anthers reduces the value of this character in Gosela, which is otherwise clearly allied to Selago.

NOTES ON A NEW ALOE FROM RHODESIA AND A NEW ALOE FROM THE TRANSVAAL.

(With Plates XX and XXI.)

By G. W. Reynolds.

There are still several species of *Aloe* awaiting description, and it is hoped that the majority will be published in the near future. In the present short paper the descriptions are given of a new *Aloe* from Rhodesia, and a new *Aloe* with remarkably bluish-grey leaves from the Pretoria District, Transvaal.

Aloe Christianii, Reynolds. Species nova et distincta. *Planta* succulenta, caulibus 1—1·3 met. longis. *Folia* 30—40, dense rosulata, lanceolato-attenuata, erecto-patentia, usque ad 75 cm. longa, 10—12 cm. lata ; supra, basi leviter concava, sensim canaliculata, viridia, immaculata ; subtus convexa, immaculata, levissime obscure striata ; ad margines sinuato-dentata, dentibus brunneis, rectis, deltoideis, pungentibus, 3—5 mm. longis, 10—20 mm. distantibus armata. *Inflorescentia* 2—3 met. alta ; scapus supra medium ramosus ; rami 5—10, sub-erecti. *Racemi* cylindrico-acuminati, usque ad 25—30 cm. longi, sub-dense 40—50 floribus. *Bracteae* ovato-acutae, 5—6 mm. longae, 3 mm. latae, albidae, scariosae, 5—7 nervatae. *Pedicelli* 10—12 mm. longi. *Perigonium* rubrum, cylindrico-trigonum, usque ad 45 mm. longum, supra ovarium haud constrictum, basi rotundatum, 9—10 mm. diam., brevissime stipitatum. *Segmenta exteriora* per 15 mm. libera, sub-acuta, patula ; interiora obtusiora, albida, rubro-carinata. *Filamenta* complanata. *Genitalia* 4—5 mm. exserta. *Ovarium* 8 mm. longum, 4 mm. diam.

Hab. Southern Rhodesia : Salisbury District, 25 miles east of Salisbury on the farm " Ewanrigg," fl. 12th June, 1936, Reynolds 1885! (type) in National Herb., Pretoria, and in Bolus Herb., Kirstenbosch. Plants No. 769.12.35 in garden of the Botanical Section, Div. of Plant Industry, Pretoria ; and in National Botanic Gardens, Kirstenbosch. (Plate XX.)

The species here described for the first time was originally collected by Mr. H. Basil Christian on his farm " Ewanrigg," 25 miles east of Salisbury, Southern Rhodesia, and is named in honour of Mr. Christian, who for many years has been an authority and cultivator of South African and Rhodesian *Aloes*. Mr. Christian is also the author of several

new species of Rhodesian *Aloes*. *A. Christianii* is widely distributed in Rhodesia, being found in the Salisbury, Hartley, Mazoe, Gwelo (Que Que) and Darwin districts. East of the Shamanoia River, and as far as Rusape, it almost invariably suckers from the base, forming groups of a dozen and more plants, while west of the Shamanoia River it never suckers, but occasionally divides at the summit into 2—3 heads. A smaller form with narrower more attenuate leaves occurs near Ndola in Northern Rhodesia. This species grows mostly on koppies among trees and bushes, sometimes on treeless flats, and is found mostly in scattered colonies of up to 20 plants, flowering usually in May and June.

In old specimens the rosette of leaves reaches 4—5 feet in diameter, the leaves often drying and turning reddish in winter, while sometimes, probably due to seasonal conditions, the leaf lower surface is broadly and deeply sulcate. Occasionally the inflorescence is sent out at an oblique angle, when this occurs the weight of the fruit usually pulls the plant over sideways. The tube and segments of *A. Christianii* are thicker and more fleshy than is usual in *Aloe*, while the degree of basal stipitation does not appear to be a fixed character and varies from incipient to distinctly stipitate.

In habit of growth, stem, rosette, leaves and height of inflorescence, *A. Christianii* somewhat resembles *A. pretoriensis* Pole Evans, in the section *Purpurascentes*, but the latter differs with larger fleshier bracts, longer pedicels, differently shaped flowers, and more divaricate branching. The small bracts, stipitation, and long perianth tube seem nearest the section *Aethiopicae*, but the short pedicels, and the combination of floral characters are such that *A. Christianii* does not fit well into any existing section.

Description.—Plant succulent, with stem simple, up to 1—1·5 met. long, erect or decumbent, 10—15 cm. diam., covered with the remains of dry leaf sheaths. *Leaves* 30—40, densely rosulate, lanceolate-attenuate, erectly spreading, up to 75 cm. long, with 10—15 cm. of the apical part dry and twisted, 10—12 cm. broad at base; upper surface slightly concave at base, gradually more canaliculate upwards, dull green, entirely immaculate; lower surface convex, dull bluish-green, very obscurely striate, entirely immaculate; margins sinuate-dentate, sub-corneous, armed with teeth 3—5 mm. long, 10—20 mm. distant, the teeth deltoid, pungent, pinkish to pale brown in colour, straight, sometimes directed slightly forward, the interspaces rounded. *Peduncle* flattened low down, 5—6 cm. diam., more terete upwards, brown, covered with a greyish powdery substance. *Inflorescence* a branched panicle 2—3 met. high, compactly branched from about or above the middle with 5—10 sub-erect branches, the 1—3 lowest sometimes with 1—2 branchlets producing a

Fig. 1.

Fig. 2.

Fig. 3.

Plate XX : *Aloe Christianii*, Reynolds.

Fig. 1. Plant in natural habitat, fl. 1 June 1936 on Mr. H. Basil Christian's farm "Ewanrigg,' Arcturus, S. Rhodesia ; the branches more arcuate than usual.
Fig. 2. Plant in natural habitat, with compact sub-erect branching typical of the species.
Fig. 3. Flowers natural size, from the bud to post-pollination stage.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Plate XXI: *Aloe Verdoorniae*, Reynolds.

Fig. 1. Plant in natural habitat, Trigaarts Poort, Pretoria District, fl. 1 July 1936.
Fig. 2. Plant ex Trigaarts Poort, fl. 14 June 1936 in Johannesburg.
Fig. 3. Raceme, one-sixth natural size.
Fig. 4. Flowers 1/1, from the bud to post-pollination stage.

total of 10—18 racemes, the lowest branches subtended at base by ovate-acute sub-scarious many nerved brownish bracts up to 6 cm. long; sometimes 2 inflorescences simultaneously. *Racemes* cylindric-acuminate, 25—30 cm. long, sub-densely 40—50 flowered, the terminal the highest, the lateral slightly shorter, unicoloured; the buds sub-erect, sub-densely imbricate, gradually laxer downwards, with the lowest open flowers cernuous to pendulous, 10—15 mm. distant. *Bracts* ovate-acute, 5—6 mm. long, 3 mm. broad, white, scarious, about 5—7 nerved. *Pedicels* the lowest of terminal racemes 9—12 mm. long, lengthening to 15 mm. in the fruit. *Perianth* nearest Pompeian Red (R.C.S.) with a bloom, cylindric-trigonous, up to 45 mm. long, straight, 9—10 mm. diam. at base, the base rounded, usually shortly stipitate. *Outer Segments* free for 15 mm., very obscurely about 5 nerved, the apices sub-acute, slightly spreading, slightly brownish. *Inner Segments* free, but dorsally adnate to the outer for two-thirds their length, white with thin edges, the upper third with a keel the colour of the perianth shading to brownish at apex, the apices brownish on inner surface, more obtuse and more spreading than the outer. *Filaments* flattened, the 3 inner narrower and lengthening in advance of the 3 outer, rather white. *Anthers* orange, 4 mm. long, the 3 inner and 3 outer in turn exserted 4—5 mm. *Style* filiform, flesh-coloured. *Stigma* at length exserted 4—5 mm. *Ovary* green, 8 mm. long, 4 mm. diam., very slightly tapering into the style, finely 6 grooved, *Capsule* about 30 mm. long, 12 mm. diam., 6 grooved, green, for some time enwrapped with the remains of the dry perianth.

Aloe Verdoorniae Reynolds. Species nova in sectione *Saponariarum*, *A. Davyanae* Schonl. affinis, sed foliis caeruleo-glaucis et maculis paucioribus obscurioribusque differt. *Planta* succulenta, acaulis, nec sobolifera, nec caespitosa. *Folia* circiter 20, dense rosulata, lanceolato-attenuata, erecto-patentia, usque ad 20—25 cm. longa, 8—9 cm. lata, carnosa; supra planiuscula, apicem versus leviter canaliculata, caeruleo-glauca, obscure lineata, maculis obscuris paucis adspersa; subtus convexa, pallidiora, obscure maculata, interdum immaculata; ad margines sinuato-dentata, dentibus corneis brunneis deltoideis pungentibus 4—5 mm. longis, circiter 10 mm. distantibus armata. *Inflorescentiae* usque ad 1 met. altae, 2—4 consequentes; scapus plerumque medio 2—3 ramosus. *Racemi* cylindrico-acuminati, usque ad 30 cm. longi 8—9 cm. lati. *Bracteae* deltoideo-acuminatae, 30—35 mm. longae, plurinervatae. *Pedicelli* usque ad ·30 mm. longi. *Perigonium* rubrum, 36 mm. longum, basi subgloboso-inflatum et circiter 7 mm. diam., supra ovarium paullum constrictum (5 ·5 mm. diam.), hinc levissime decurvatum et faucem versus ampliatum. *Segmenta exteriora* per

10 mm. libera, marginibus pallidioribus, obscure 5—7 nervatae ; interiora latiora, obtusiora. *Filamenta* complanata. *Genitalia* 2—4 mm. exserta. *Ovarium* 8 mm. longum, 3 mm. diam.

Hab. Transvaal : Pretoria District, Trigaarts Poort, fl. 27 June, 1935, Verdoorn 1623! ; fl. 1 July 1936, Verdoorn 1624!, in National Herbarium Pretoria and Bolus Herb. Kirstenbosch ; cultivated plant ex Trigaarts Poort fl. 14th June 1936 in Johannesburg, Reynolds 963!, in Nat. Herb. Plants 344.6.35 in garden of Botanical Section, Div. of Plant Industry, Pretoria, and 1557/36 in National Botanic Gardens, Kirstenbosch. (Plate XXI.)

This new *Aloe* with its very distinctive leaves, was collected by Miss I. C. Verdoorn, Botanist at the Division of Plant Industry, Pretoria, and is named in honour of the collector, to whom so many plant lovers are greatly indebted for the identification of their specimens. At Trigaarts Poort, which is about 12 miles north-east of Bronkhorstspruit on the Rhenosterkop road, this species is found on both sides of the poort, on grassy rocky slopes, sometimes wedged in between rocks, and in fairly large numbers. Dr. D. F. du T. Malherbe, Pretoria University, has collected it much further east at a point about 15 miles north-west of Belfast. It is also found near the Premier Mine, where it grows socially with *A. pretoriensis* Pole Evans, and *A. Davyana* Schonl., while Dr. F. Z. v.d. Merwe has also collected it 17 miles west of Witbank, near Balmoral.

A. Verdoorniae is variable in shape and size of flowers, but it is immediately distinguished from all others in the Section *Saponariae* by its peculiar bluish-grey leaves with the pronounced horny reddish-brown margin standing out in sharp contrast. Usually the upper surface is sparingly and obscurely spotted, with a few spots on the lower surface ; some plants are found with both surfaces immaculate, while in others the lower surface is more spotted than the upper. At Trigaarts Poort this species is not found in association with any other *Aloe*, and the bluish-grey leaves is a fixed character. The spots are always rather obscure, scattered, and not in regular transverse bands. In mature specimens, up to 4 consecutive inflorescences appear, the peduncles being branched at the middle or lower, each bearing 2—3 racemes.

In racemes and flowers *A. Verdoorniae* appears to be nearest allied to *A. Davyana* Schonl., but in the typical form of the latter from Pretoria hills, the leaves are much greener, with the spots more copious and more clearly defined, while the bracts are shorter and less fleshy, with the buds more distinctly striped and the flowers much paler in colour. Solitary plants occur wild ; the species does not sucker and form dense groups, and usually flowers during June and July. The leaf sap does not discolour.

Description.—Plant succulent, acaulescent, solitary, not stoloniferous, *Leaves* about 20, densely rosulate, lanceolate, attenuate, erectly spreading. slightly recurved near apex, up to 20 cm. long with an additional 5—10 cm. of the apex dry and twisted, 8—9 cm. broad at base, rather fleshy ; upper surface flat or slightly concave at base, slightly more canaliculate upwards, obscurely lineate, sometimes immaculate, usually with a few scattered rather obscure dull whitish oval spots ; lower surface convex, paler than the upper, immaculate, or with several obscure dull white spots, the spots scattered, not arranged in regular transverse bands ; the margins sinuate-dentate, armed with deltoid pungent slightly deflexed reddish-brown teeth 4—5 mm. long, about 10 mm. distant, joined by a thick reddish-brown corneous line, the interspaces rounded. *Inflorescence* 2—4 consecutively, up to 1 met. high. *Peduncle* flattened low down, 3 cm. diam., semi-terete upwards, brown, lightly covered with a greyish powdery substance ; usually with 2—3 branches from the middle of lower, the lowest branch subtended at base by an ovate-acuminate sub-scarious many nerved bract up to 10 cm. long, 3 cm. broad at base ; the branches below the racemes clothed with several deltoid acuminate many nerved sterile bracts up to 3 cm. long, the bracts rather fleshy near base, spreading and more scarious above. *Racemes* unicoloured, cylindric-acuminate, the terminal about 30 cm. long, 8—9 cm. diam., the buds sub-erect, densely imbricate, obscurely dull striped, with their bracts as long, gradually laxer downwards with the lowest open flowers up to 25 mm. distant, cernuous to sub-pendulous. *Bracts* deltoid-acuminate, as long as their pedicels or slightly longer, many nerved, rather fleshy and sub-amplexicaul at base, more scarious and spreading above. *Pedicels* the lowest of terminal racemes up to 3 cm. long. *Perianth* coral-red (R.C.S.) with a bloom, about 36 mm. long, with a sub-globose basal swelling 7 mm. diam., constricted above the ovary to 5·5 mm., thence slightly decurved and enlarging a little towards the throat, slightly compressed laterally. *Outer Segments* free for 10 mm., very obscurely 5—7 nerved, the margins with pale 1 mm. wide border, the apices sub-acute, spreading, slightly brownish. *Inner Segments* dorsally adnate to the outer for 25 mm., broader than the outer, with broader pale margins, and more obtuse more spreading brownish apices. *Filaments* pale lemon, flattened, the 3 inner narrower and lengthening in advance of the 3 outer. *Anthers* the 3 inner and 3 outer in turn exserted 2—4 mm. *Style* yellower than the filaments. *Stigma* at length exserted 2—4 mm. *Ovary* 8 mm. long, 3 mm. diam., finely 6 grooved, green.

REGENERATION AFTER CLEARING AT KIRSTENBOSCH.

By

Elsie E. Esterhuysen.

(With Plate XXII.)

It was considered of interest to make a record of the plants growing on a newly cleared piece of ground in Kirstenbosch, with observations on the occurrence of species, colonisation and succession. The ground was formerly covered with a dense growth of selfsown Pinus pinaster, 19 years old, and had been planted with this Pine about 30 years before; so that it had been occupied by pine forest altogether for about 50 years, except in the interval between clearing and regeneration, in about 1915-16. The area was cleared by felling of the pines and burning of the debris in sections during 1933-35, at which time there was very little undergrowth except on tracks and fire-paths. Part of the clearing more or less centrally situated was selected for this work, covering an area of about 25 acres, as shown in the plan (Fig. 1), and collecting was done from March, 1935, to January, 1936 (except for 6 weeks during May and June). The record is claimed to be complete only for plants present in December, 1935. It will be of interest to repeat the survey of this area (in which Pines are to be excluded in future) from time to time. It is hoped that the study may help to answer the question whether typical indigenous vegetation can re-establish itself upon such an area of Pine plantation after clearing.

The clearing is on a talus slope, of low gradient for the most part, formed of an accumulation of rocks of the Table Mountain Sandstone series over granite, the soil being mostly sandy. The habitat is more or less the same over the area selected, except for a small part where a stream forms in winter. The altitude of the area extends from 300 to 500 ft. above sea level.

The occurrence of most species is very erratic, so that a species which is occasional over most of the area may be frequent in some parts and absent in others; where the proportion of individuals is low a species is recorded as of occasional occurrence.

THE FLORA.

The following is the list of species collected, arranged in families according to the system of classification of Bentham and Hooker. The collection is housed at Kirstenbosch. The totals are: Genera 224: Species 402.

(*R* = rare ; *O* = occasional ; *F* = frequent ; *A* = abundant. Species in italics are aliens or escapes from cultivation.)

Ranunculaceae.
R. Knowltonia hirsuta, DC.
O. K. vesicatoria, Curt.
O. Ranunculus pubescens, Thunb. (R. pinnatus, Poir.)
Menispermaceae.
R. Antizoma capensis, Diels.
Papaveraceae.
O. Fumaria Mundtii, Spreng.
O. F. officinalis, Linn.
R. Corydalis Cracca, Schl.
Cruciferae.
R. ? *Senebiera didyma*, Pers.
O. Heliophila scoparia, Burch.
R. Raphanus Raphanistrum, Linn.
Violaceae.
O. Viola tricolor, Linn.
Flacourtiaceae.
R. Kiggelaria africana, Linn.
Polygalaceae.
F. Muraltia Heisteria, DC.
F. Polygala bracteolata, Linn.
R. P. myrtifolia, Linn.
Caryophyllaceae.
O. Cerastium Dregeanum, Fenzl.
O. Polycarpon tetraphyllum, L.f.
F. Silene gallica, Linn.
O. S. undulata, Ait.
R. Spergula arvensis, Linn.
Malvaceae.
O. Hibiscus aethiopicus, Linn.
O. H. trionum, Linn.
R. Malvastrum capense, Gray and Harv.
Sterculiaceae.
F. Hermannia hyssopifolia, Linn.
Linaceae.
O. Linum quadrifolium, Linn.
Geraniaceae.
R. Geranium dissectum, Linn.
F. G. incanum, Linn.
R. Pelargonium betulinum, Ait.
F. P. capitatum, Ait.
F. P. chamaedrifolium, Jacq.
A. P. cucullatum, Ait.
R. P. Dodii, Schl. ex Knuth.
F. P. grossularioides, Ait.

Geraniaceae.
O. P. myrrhifolium, Ait.
R. P. radula, Ait.
O. P. saniculifolium, Willd.
O. P. tabulare, L'Herit.
O. P. triste, Ait.
R. Oxalis glabra, Thunb.
O. O. lanata, Lf.
R. O. variabilis, Lindl.
R. O. versicolor, Linn.
Celastraceae.
O. Gymnosporia buxifolia, Syzsz.
O. G. laurina, Thunb.
R. G. acuminata, Syzsz.
Rhamnaceae.
O. Phylica capitata, Thunb.
R. P. imberbis, Berg, var. eriophora, Pillans MS.
R. P. stipularis, Linn.
Anacardiaceae.
O. Rhus angustifolia, Linn.
R. R. lucida, Linn.
O. R. mucronata, Thunb.
O. R. tomentosa, Linn.
Leguminosae.
F. Podalyria calyptrata, Willd.
R. Liparia sphaerica, Linn.
O. Rafnia triflora, Thunb.
O. Borbonia cordata, Linn.
O. Aspalathus astroites, Linn.
R. A. Benthami, Harv.
F. A. divaricata, Thunb.
O. A. macrantha, Harv.
R. A. thymifolia, Linn.
F. Argyrolobium lanceolatum, E. and Z.
O. Trifolium agrarium, L.
F. T. angustifolium, L.
R. Psoralea aculeata, Linn.
O. P. bracteata, Linn.
R. P. decumbens, Ait.
F. P. pinnata, Linn.
R. Indigofera coriacea, Ait.
F. I. cytisoides, Thunb.
O. I. filifolia, Thunb.
F. I. filiformis, Thunb.
F. I. gracilis, Spreng.

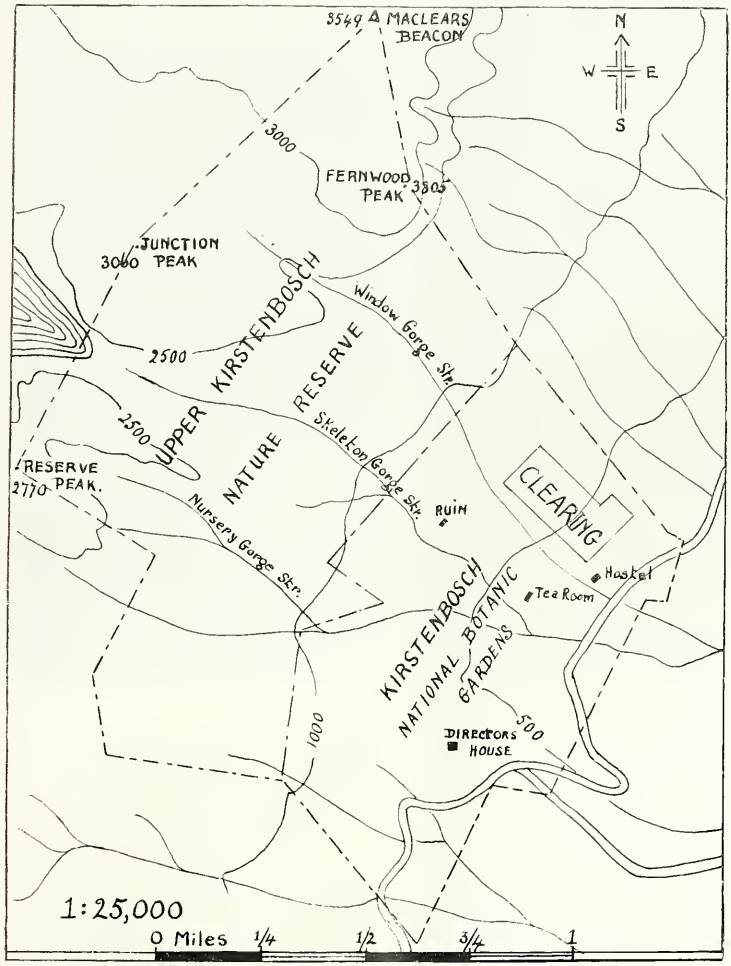


FIG. 1. Plan of Kirstenbosch, showing position of Clearing. (Del. W. F. Barker.)

PLATE XXII.

FIG. 1. *Indigofera cytisoides* (right) and *Podalyria calyptrata* (loft) forming thickets, with *Roella decurrens* growing around and amongst them. In the foreground are *Osteospermum moniliferum*, *Metalasia muricata*, grasses, etc.

FIG. 2. *Roella decurrens*; with the more recently cleared area beyond.

FIG. 3. *Roella decurrens*, growing on a rocky slope.

FIG. 4. Close growth of *Helichrysum capitellatum*, *Ehrharta aphylla*, *Roella decurrens*, etc., with *Aspalathus divaricata* in foreground (right) and forming dense thickets at the back.

Leguminosae.

R. I. sarmentosa, L.f.
O. Lessertia linearis, DC.
F. Hallia cordata, Thunb.
F. H. imbricata, Thunb.
R. *Vicia sativa, Linn.*
F. Dolichos gibbosus, Thunb.
F. Fagelia bituminosa, DC.
F. Rhynchosia totta, DC.
O. Virgilia capensis, Lam.
R. *Acacia saligna, Wendl.*
O. *A. longifolia, Willd.*
O. *Albizzia lophantha, Benth.*

Rosaceae.

R. Alchemilla capensis, Thunb.
O. Cliffortia filifolia, L.f.
F. C. polygonifolia, L. var. trifoliata, (L.) Harv.
O. C. ruscifolia, Linn.
R. *Rubus fruticosus, Linn.*
R. R. pinnatus, Willd.

Crassulaceae.

R. Crassula flava, Linn.
R. C. glomerata, Linn.
R. C. scabra, L.f.
O. C. septas, Thunb.
R. Rochea coccinea, DC.
R. R. odoratissima, DC.

Droseraceae.

R. Drosera hilaris, Cham. and Schl.

Halorrhagidaceae.

R. Serpicula repens, Linn.

Onagraceae.

R. Epilobium tetragonum, Linn.
R. *Oenothera biennis.*
R. *Oenothera noctiflorum.*
F. Montinia acris, L.f.

Cucurbitaceae.

R. Melothria punctata, Cogn.

Ficoideae.

R. Carpobrotus acinaciformis, L. Bolus.
O. C. edulis, N.E. Br.
R. *C. ?Muirii, L. Bolus, var. angusta.*
F. Erepsia bracteata, N.E. Br.
R. Mesembryanthemum monticolum, L. Bolus.
R. Skiatophytum Tripolium, L. Bolus.

Umbelliferae.

O. Hermas depauperata, L. (H. villosa, Thunb.)
O. Hydrocotyle Centella, Ch. and Schl.
R. H. tridentata, L.f.
F. Lichtensteinia lacera, Ch. and Schl.
O. Oenanthe filiformis, Lam.
O. Peucedanum Galbanum, B. and H.
R. P. Sieberianum, Sond.
F. P. tenuifolium, Thunb.
R. Caucalis africana, Thunb. (Torilis africana, Spreng.)

Rubiaceae.

O. Anthospermum aethiopicum, Linn.
R. A. ciliare, Linn.
O. A. hirtum, Cruse.
O. Carpacoce spermacocea, Sond.
R. Plectronia ventosa, Linn.

Dipsaceae.

O. Cephalaria rigida, Schrad.
R. Scabiosa Columbaria, Linn.

Compositae.

R. Corymbium nervosum, Thunb.
R. Aster fruticulosus, Linn.
R. Felicia (A. tenellus, Linn.)
R. F. (A. capensis, Less.).
F. *Erigeron canadense, Linn.*
F. *Conyza ambigua, DC.*
O. Chrysocoma Coma-aurea, Linn.
F. Gnaphalium candidissimum, Lam
F. *G. luteo-album, Linn.*
O. *G. purpureum, Linn.*
R. Helipterum speciosissimum, DC.
R. Helichrysum auriculatum, Less.
F. H. capitellatum, Less.
R. H. crispum, Less.
F. H. cymosum, Less.
R. H. ericifolium, Less.
R. H. ericifolium var. lineare, Harv.
F. H. expansum, Less.
O. H. foetidum, Cass.
R. H. fruticans, Less.
R. H. humile, Andr.
F. H. odoratissimum, Less.
R. H. rubellum, Less.
R. H. rutilans, Less.
R. H. serpyllifolium, Less.
R. H. sesamoides, Thunb.
F. Stoebe cinerea, Thunb.

Compositae.

R. S. incana, Thunb.
R. S. plumosa, Thunb.
R. S. ?prostrata, Linn.
O. Leontonyx glomeratus, DC. var. intermedius.
F. L. spathulatus, Less.
R. L. spathulatus, var. candidissimus.
R. L. squarrosus, DC.
R. Leyssera gnaphalioides, L.
F. Metalasia muricata, Less.
R. Printzia aromatica, Less.
R. Osmites dentata, Thunb.
O. *Bidens pilosa, Linn.*
O. Athanasia crithmifolia, Linn.
O. Cotula (Cenia) turbinata, Linn.
O. Alciope tabularis, DC.
F. Senecio Burchellii, DC.
R. S. elegans, Link.
F. S. erubescens, Ait.
F. S. grandiflorus, Berg.
O. S. halimifolius, Linn.
O. S. laevigatus, Thunb.
R. S. lanceus, Ait.
O. *S. pterophorus, DC. var. aptera, Harv.*
F. S. pubigerus, Linn.
R. S. verbascifolius, Burm.
O. S. rigidus, Linn.
R. S. rosmarinifolius, L.f.
O. S. subcanescens, Compton.
O. S. umbellatus, Linn.
R. *S. glastifolius, L.f.*
R. Othonna parviflora, Linn.
R. O. tuberosa, Thunb.
O. Osteospermum moniliferum, Linn.
O. Ursinia crithmifolia, Spreng.
F. U. dentata, Poir.
R. U. cakilefolia, DC.
R. Haplocarpha lanata, Less.
O. Gerbera Burmannii, Cass.
A. *Hypochoeris radicata, Linn.*
F. *Sonchus olcraceus, Linn.*
R. *Tripteris hyoseroides, DC.*
R. Cineraria geifolia, L. var. glabra.
R. Arctotis sp.

Campanulaceae.

F. Lobelia coronopifolia, Linn.
O. L. Erinus, Linn.
R. L. lutea, Linn.

Campanulaceae.

O. L. pinifolia, Linn.
O. L. triquetra, Linn.
F. Cyphia bulbosa, Berg.
R. C. volubilis, Willd.
R. Lightfootia oxycoccoides, L'Hérit.
O. Wahlenbergia capensis, DC.
F. W. cernua, DC.
F. W. cernua, var. minor, Sond.
O. W. exilis, DC.
A. Roella decurrens, L'Hérit.
O. R. ciliata, Linn.
O. Treichelia longebracteata, Vatke.
R. Prismatocarpus nitidus, L'Hérit.

Ericaceae.

O. Erica hirtiflora, Curt.
R. E. imbricata, Linn.
R. E. Plukenetii, Linn.
R. E. ramentacea, Linn.
R. E. thymifolia, Andr.
R. E. sp. ? mammosa, Linn.
R. Scyphogyne inconspicua, Brongn.
R. Simocheilus glabellus, Benth.

Primulaceae.

F. *Anagallis arvensis, Linn.*
F. *A. arvensis, var. coerulea, Gren. and Godr.*

Myrsinaceae.

O. Myrsine africana, Linn.

Ebenaceae.

O. Royena glabra, Linn.
O. R. lucida, Linn.

Oleaceae.

O. Olea capensis, Linn.
O. O. verrucosa, Link.

Asclepiadaceae.

R. Asclepias crispa, Berg.
R. Secamone Alpini, Schult.

Gentianaceae.

F. Sebaea aurea, R.Br.

Solanaceae.

R. *Physalis peruviana, L.*
R. *Solanum aculeastrum, Dun.*
R. *S. auriculatum, Linn.*
O. *S. nigrum, Linn.*

Scrophulariaceae.

R. *Verbascum virgatum, With.*
F. Hemimeris montana, L.f.
O. Nemesia chamaedrifolia, Vent.
R. *N. foetens, Vent.*

Scrophulariaceae.
O. N. lucida, Benth.
R. Halleria lucida, Linn.
R. Teedia lucida, Rud.
F. Zaluzianskya dentata, Walp.
F. Phyllopodium capitatum, Benth.
R. Sutera brachiata, Roth.
O. Melasma luridum, Hiern.
O. Diascia elongata, Benth.

Myoporaceae.
F. Oftia africana, Bocy.

Selaginaceae.
F. Dischisma ciliatum, Chois.
O. Selago corymbosa, Linn.
R. S. quadrangularis, Chois.
O. S. serrata, Berg.
F. S. spuria, Linn.
O. Agathelpis angustifolia, Chois.

Verbenaceae.
R. *Verbena bonariensis, Linn.*
R. *V. officinalis, Linn.*

Labiatae.
O. *Cedronella triphylla. Moench.*
R. Salvia paniculata, Thunb.
R. Leonotis Leonurus, R.Br.

Plantaginaceae.
R. *Plantago lanceolata, Linn.*

Amarantaceae.
R. Achyranthes argentea, Lam.

Chenopodiaceae.
O. *Chenopodium ambrosioides, Linn.*

Phytolaccaceae.
F. *Phytolacca octandra, L.*

Polygonaceae.
O. *Polygonum aviculare, Linn.*
F. *Rumex Acetosella, Linn.*
O. R. cordatus, Desf.
R. *R. crispus, Linn.*
R. *R. pulcher, Linn.*

Lauraceae.
R. Cassytha ciliolata, Nees.

Proteaceae.
R. Leucospermum conocarpum, R. Br.
R. Serruria Burmanni, R. Br.

Thymelaeaceae.
F Passerina vulgaris, Thoday.
O. Gnidia juniperifolia, Lam.
O. G. sericea, Linn.

Santalaceae.
O. Thesium scabrum, Linn.
F. T. strictum, Berg.
O. T. virgatum, Lam.
F. Thesidium longifolium, A. W. Hill.

Euphorbiaceae.
R. Euphorbia erythrina, Link.
O. *E. Helioscopia, Linn.*
O. *E. Peplus, Linn.*
O. E. tuberosa, Lam.
O. Cluytia alaternoides, Muell-Arg.
O. C. pulchella, Linn.
R. C. pterogona, Muell-Arg.
R. Leidesia capensis, Muell-Arg.

Myricaceae.
O. Myrica quercifolia, Linn.

Coniferae.
O. Widdringtonia cupressoides, Schrad.

Orchidaceae.
R. Acrolophia tristis, Sch. and Bolus.
R. Satyrium ligulatum, Lindl.
R. S. odorum, Sond.
O. Disa macrantha, Bolus.

Haemodoraceae.
F. Wachendorfia paniculata, Linn.
O. W. sp.
F. Cyanella capensis, Linn.

Iridaceae.
R. Morea crispa, Ker.
F. M. edulis, Ker. var. longifolia, Sweet.
R. M. ramosa, Ker.
O. M. tricuspis, Jacq.
O. M. tripetala, Ker.
F. Homeria collina, Vent.
O. Hexaglottis longifolia, Vent.
O. Bobartia gladiata, Ker.
O. B. spathacea, Ker.
O. Aristea capitata, Ker.
O. A cyanea, Soland.
R. A. spiralis, Ker.
R. A. sp. nov.
R. Geissorhiza secunda, Ker.
O. Ixia polystachya, Linn.
O. Micranthus plantagineus, Eckl.
O. Watsonia punctata, Ker.
O. W. rosea, Ker.
R. W. tabularis, Mathews and Bolus.

Iridaceae.

O. Gladiolus brevifolius, Jacq.
R. Chasmanthe aethiopica, N.E. Br.
O. Anapalina triticea, N.E. Br.

Amaryllidaceae.

R Haemanthus coccineus, Linn.
O. Hypoxis stellata, L.f.

Liliaceae.

O. Asparagus africanus, Lam.
R. A. scandens, Thunb.
O. A. Thunbergianus, Schult.
R. Kniphofia uvaria, Hook.
F. Bulbine favosa, Roem. and Schultes.
R. B. praemorsa, Roem. and Schultes.
O. Anthericum elongatum, Bak.
O. A. hirsutum, Thunb.
O. A. longifolium, Jacq.
O. Agapanthus africanus, Linn.
O. Lachenalia glaucina, Jacq.
F. Ornithogalum hispidum, Horn.
R. O. lacteum, Jacq.
O. Baeometra columellaris, Salisb.
O. Caesia Dregeana, Kunth.
R. C. Eckloniana, Roem. and Schultes
O. Albuca minor, Linn.
O. A. major, Linn.

Juncaceae.

R. Juncus anonymus, Steud.
R. J. capensis, Thunb. var. Ecklonii, Buchen.
O. J. capensis, Thunb. var. macranthus, Adamson.
R. J. Sphagnetorum (Buch.) Adamson.

Araceae.

R. Richardia africana, Kunth.

Restionaceae.

R. Restio cuspidatus, Thunb.
R. Thamnochortus dichotonus, R.Br.
R. T. fruticosus, Berg.

Cyperaceae.

O. Mariscus congestus, C. B. Clarke.
R. M. riparius, Schrad.
F. Scirpus antarcticus, Linn.
R. S. Ludwigii, Boeck.
R. S. prolifer, Rottb.

Cyperaceae.

R. S. sp.
F. Ficinia bracteata, Boeck.
F. F. bulbosa, Nees.
O. F. fastigiata, Nees.
F. F. filiformis, Schrad.
O. F. ramosissima, Kunth.
R. F. scariosa, Nees.
R. F. setiformis, Schrad.
R. Carpha glomerata, Nees.
O. Tetraria cuspidata, C.B.Cl.
R. T. compar, Lestib.
O. T. sylvatica, C.B.Cl.
R. T. ustulata, C.B.Cl.

Gramineae.

O. Andropogon Nardus, Linn. var. marginatus, Hack.
O. Paspalum dilatatum, Poir.
R. P. sp.
R. Pennisetum macrourum, Trin.
R. Stenotaphrum glabrum, Trin.
O. Holcus setiger, Nees.
R. Koeleria cristata, Pers.
R. Avena fatua, Linn.
O. A. sativa, Linn.
R. Pentachistis aspera, Stapf.
F. P. Thunbergii, Stapf.
O. Danthonia lanata, Schrad.
O. D. stricta, Schrad.
O. D. macrantha, Schrad.
O. Lagurus ovata, Linn.
R. Polypogon tenuis, Brongn.
O. Agrostis lachnantha, Nees.
F. Aira caryophyllea, Linn.
R. Sporobolus indicus, R. Br.
R. Eragrostis curvula, Nees.
O. Cynodon Dactylon, Pers.
F. Ehrharta calycina, Sm.
O. E. erecta, Lam.
O. E. longifolia, Schrad.
O. E. Rehmannii, Stapf.
F. E. aphylla, Schrad.
O. Phalaris minor, Retz.
F. Cynosurus echinatus, L.
F. Brizopyrum capensis, Trin.
R. B. capensis Trin. var. villosum, Stapf.
F. Briza maxima, Linn.
O. B. minor, Linn.
F. Festuca scabra, Vahl.

Gramineae.
O. Bromus maximus, Desf.
R. B. patulus, Mert. and Koch. var. vestitus Stapf.
O. Brachypodium flexum, Nees.
O. Lolium temulentum, Linn.

Filices.
F. Pteridium aquilinum, Kuhn.
R. Pellaea pteroides (Linn.) Prantl.
R. Asplenium adiantum-nigrum, Linn
R. Mohria caffrorum, Desv.
O. Schizaea pectinata, Sw.

Colonisation and Succession.

Colonisation can be observed to have taken place from—

(*a*) plants present or at hand before the ground was cleared, such as *Pelargonium cucullatum, Senecio pubigerus, Oftia africana*, etc. ;

(*b*) a small strip of sub-climax association on a rocky slope above and adjoining the clearing. (Apart from this the clearing is bounded by oak forest, Eucalyptus and Pine plantations and forest growing amongst talus boulders.) Such colonizers are *Ehrharta aphylla, Peucedanum tenuifolium, Cephalaria rigida*, etc. ;

(*c*) more distant sources. Examples of interest are those plants which have arrived from the mountain, and grow normally on the plateau or in the region of S.-E. cloud, such as *Senecio verbascifolius* and *Prismatocarpus nitidus*, or on cliffs as *Rochea coccinea, Mesembryanthemum monticolum* and *Crassula scabra*. It is apparent that these plants will not survive long here, either dying with the progress of summer or being choked out. Several plants grown in the adjoining cultivated portion of the Gardens have come up in small numbers.

Stages in the regeneration can be inferred from observation of growth on successively cleared sections of the area. That cleared towards the beginning of 1935 had the ground covering of pine needles remaining, whereas some sections had been burnt after clearing. Here, where the covering is thicker, pine seedlings only are growing ; patches are present, however, where rubbish was burnt and on these seedlings have come up abundantly, chiefly the following :—

Senecio Burchellii, S. pubigerus, S. rigidus, Selago spuria, Scirpus antarcticus, Pelargonium cucullatum, P. capitatum, P. chamaedrifolium, Roella decurrens, Hypochoeris radicata, Thesium strictum, Thesidium longifolium, pine seedlings being absent. Some burnt patches have a thick growth of one species, indicating the presence of the seeds before burning and, where the surrounding ground is more open, the advantageous effect of burning on germination. Such species are *Albizzia lophantha, Indigofera cytisoides, Psoralea pinnata* and *Pelargonium cucullatum*. As the ground becomes clearer plants obtaining a hold are extremely varied. On another section where the ground apparently was not burnt an association still very open consists of the above-mentioned species, and the following :—

Phyllopodium capitatum, Silene gallica, Sonchus oleraceus, Briza maximus, Dischisma ciliatum, Lobelia triquetra amongst the annual species, and others are *Senecio erubescens, S. umbellatus, Erigeron canadense, Montinia acris, Lichtensteinia lacera, Peucedanum tenuifolium, Alciope tabularis, Erepsia bracteata, Pteridium aquilinum, Ornithogalum hispidum,* etc.

With further development the association becomes more closed, plants such as *Helichrysum odoratissimum* and *Ursinia dentata* spreading on the ground, with taller plants growing above such as *Pelargonium cucullatum, Senecio pubigerus, Osteospermum moniliferum ;* aggressive plants are *Aspalathus divaricata, Oftia africana* and *Roella decurrens ;* patches between are covered with *Helichrysum expansum, Hypochoeris radicata, Erepsia bracteata, Pentaschistis Thunbergii,* etc.

On exposed rocky ground an open association is composed of the following :—*Thesium strictum, Pelargonium cucullatum, Roella decurrens, Podalyria calyptrata, Ficinia filiformis, Muraltia Heisteria, Peucedanum tenuifolium, Royena glabra, Passerina vulgaris, Psoralea pinnata, Selago spuria, Helichrysum expansum, Albuca minor, Anapalina triticea, Tetraria ustulata, T. cuspidata, Indigofera filiformis, Metalasia muricata, Stoebe cinerea, Hermas depauperata, Thesidium longifolium, Ficinia bulbosa,* etc.

Beside this in a slight hollow where the soil is moister an almost closed association is found containing most of the above-mentioned plants and others, such as *Hallia cordata, H. imbricata, Thesium scabrum, Brizopyrum capensis.* Here *Psoralea pinnata* forms thickets, while *Roella decurrens* and others such as *Borbonia cordata* become aggressive.

On a higher part of the clearing the association is composed of the same species as already mentioned and others such as *Festuca scabra, Bobartia spathacea, Aristea capitata, Hermannia hyssopifolia,* etc. The association becomes closed with such plants as *Aspalathus divaricata, Fagelia bituminosa, Dolichos gibbosus, Danthonia macrantha, Roella decurrens, Ehrharta aphylla,* spreading and together with *Indigofera cytisoides* becoming dominant in patches. In one part a dense mass is formed from *Fagelia bituminosa* enclosing *Aspalathus astroites, A. divaricata* and *Indigofera cytisoides,* with *Senecio pubigerus, S. rigidus* and *Osteospermum moniliferum* struggling up, and *Ficinia filiformis* and *Helichrysum odoratissimum* growing underneath. *Roella decurrens* *

* *Roella decurrens,* which is usually of rare occurrence and slender habit, is extremely abundant and of robust habit here. Seedlings are growing prolifically almost everywhere. The plants spread and form a dense growth in winter and spring and with the onset of summer take on a coppery colour ; they reach about two feet in height. The life of the plants may be only three or four years. The species is apparently a pioneer and not a permanent component of the climax vegetation.

forms an almost pure association in parts, growing densely, with *Ehrharta aphylla*, *Indigofera cytisoides*, *Pelargonium cucullatum* and *Senecio grandiflorus* growing amongst it.

Other communities to be noted on the clearing are the following :— *Aspalathus divaricata* and *Podalyria calyptrata* forming an almost pure association with *Senecio pubigerus* occurring here and there : *Aspalathus macrantha* with *Fagelia bituminosa* enclosing it, forming a closed association ; *Aspalathus divaricata* is also present : *Rafnia triflora*, *Aspalathus divaricata* and *Fagelia bituminosa* forming a closed association : *Rafnia triflora* growing densely, to its full height, with plants beneath it covering the ground densely, including seedlings of *Osteospermum moniliferum*, *Phylica capitata*, *Anthospermum hirtum*, etc. : *Indigofera cytisoides* forming a pure thicket in parts. The germination of these thickly growing Leguminosae is apparently favoured by burning. It appears probable that the seeds of these Leguminosae, which have now germinated in great numbers, had lain in the ground for at least 15 years.

At the time of this survey the vegetation consists of an irregular tangle of herbaceous plants, quick-growing soft-wooded shrubs, herbaceous climbers, shrubby Leguminosae with hard-coated resting seeds whose germination is favoured by burning, bulbous plants and annuals. There are signs of the regeneration of certain Proteaceae, Ericaceae and other hard-wooded shrubs which may become components of the climax vegetation of open slopes, but hitherto there is nothing to suggest the regeneration of sclerophyll forest. The majority of the plants present are clearly members of an early stage in a secondary succession and will soon disappear and be succeeded by a later phase : and it will be of considerable interest to survey the progress of the succession from time to time.

In conclusion I wish to thank Professor R. H. Compton, who suggested the investigation and who assisted me in the production of this paper, and Mrs. L. Bolus for giving facilities for work in the Bolus Herbarium. The survey was undertaken while I held the Edward Muspratt Solly Scholarship at Kirstenbosch for 1935.

A NEW TUMBLE WEED FROM SOUTH AFRICA.

By A. A. Obermeijer, M.Sc.

Anthericum erraticum, Obermeijer spec. nov.

Rhizoma repens compacta. *Folia* multa, cylindrica, ad 40 cm. longa et 3 mm. in diametro, carnosa. *Inflorescentia* paniculata sed ad basin umbellata, ad 60 cm. alta; pedunculus 18—26 cm. longus, ad apicem clavatus; rami secundi 3 (rarius 4) ad apicem pedunculus insertis; rami floriferi alternati, ad juventute erecti, ultimo patentes et recurvati; pedicelli 6 mm. longi, solitarii, non-articulati. *Bracteae* membranaceae, deciduae, brunneo-costatae. *Tepala* alba, recurvata, brunneo-costata. *Stamina* filamenta ad basin connata, patenti, scabri, gibbosi; *anthera* introrsa. *Ovarium* loculi circiter 8—ovulati; stylus glaber; stigma penicillatum.

Rhizome creeping, compact, perennial. *Roots* many, somewhat fleshy. *Leaves* many, deciduous, terete, up to 40 cm. long, 3 mm. in diam., minutely longitudinally grooved and with minute immersed glands,

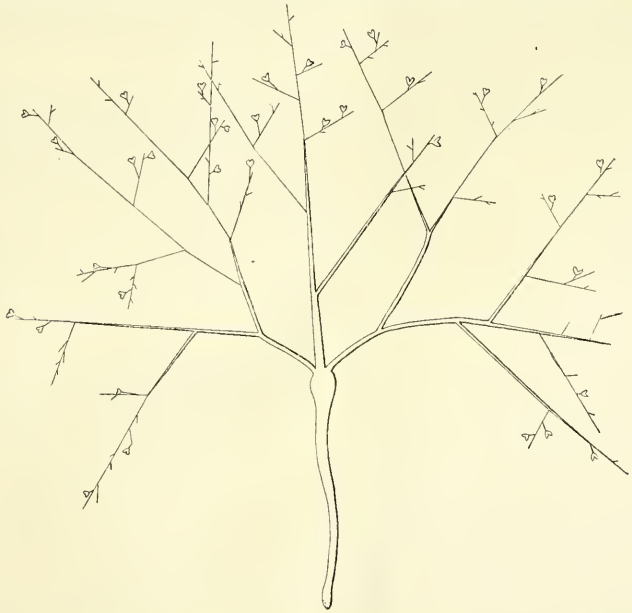


Fig. 1. *Anthericum erraticum,* Obermeijer. Dry inflorescence, semi-diagrammatic.

sheathed at the base. *Inflorescence* a panicle but pseudo-umbellate at the base,* up to 60 cm. long and when dry, about as broad, at first erect, herbaceous, afterwards spreading, ligneous, becoming detached from the rhizome when the seeds have ripened and the capsules are ready to burst. *Peduncle* 18—26 cm. long, swollen and clavate at the apex. *Sidebranches* branching alternately and copiously. *Pedicels* ± 6 mm. long, solitary, not articulate. *Bracts* broadly ovate, membranous, deciduous, with a brown keel. *Tepals* white with a stout brown keel and a yellow spot near the base, connate at the very base only, spreading, recurved. *Stamens* didymous, connate into a tube at the base and there white and somewhat scabrid, upper half of the filaments yellow, patent, densely and retrorsely scabrous, with a ventral gibbosity near the middle of the filament. *Anthers* introrse, dorsifixed. *Ovary* with 6—10 ovules in each loculus, glabrous, hidden by the staminal tube; style white, glabrous, ultimately overtopping the stamens; stigma minute, penicillate. *Capsule* 2 mm. long, glabrous. Base of the perianth persistent. *Seeds* dark-brown, 3 angled (probably somewhat sticky).

Distribution: A common psammophyte found in the grassveld of the Western Transvaal, Free State, Griqualand West and Bechuanaland. It flowers in late summer (i.e. about January) and the inflorescences start rolling about in April.

Transvaal:—Wolmarans District; Maquassi *leg.* van Niekerk, T.M. 35736, *type*! (Transvaal Museum). Waterberg District; Radium near Warmbaths, *leg.* Obermeijer T.M. 35737 (Transvaal Museum),† Mosdene near Naboomspruit, *leg.* Galpin M. 353 (National Herbarium); Naboomspruit, *leg.* Murray 685 (National Herbarium).

Orange Free State:—Boshof District, between Sandfontein and Boshof, *leg.* Schweickerdt 115 (National Herbarium) "common in grassveld; the inflorescences after maturity are carried away by the wind, become heaped up against fences and break these down; called 'waaibos'."

Cape Province:—Barkly West, border in loose, white sand in camp below station *leg.* C. A. Smith, 2332 (National Herbarium) "fairly common perennial" Kimberley District, Doornfontein, *leg.* Adams (McGregor Museum); Kuruman District, Kuruman, *leg.* Pole Evans

* The inflorescence is usually trichotomous at the base. From the position of the bracts, however, it can be ascertained that one of these three branches must be regarded as a continuation of the main stem while one of the two true side branches is always situated slightly above the other.

† When visiting Radium in August 1935 I noticed the dried inflorescences to be very common in the fences and bushes and was told that the plants had flowered in January when the veld had been full of them. However, when I visited the locality again six months later, only a few plants could be located. The late rains or intensive grazing or a combination of both may have had something to do with this.

2119 (National Herbarium), Bathlaros, *leg.* Silk, 211 (National Herbarium), Wonderwerk, *leg.* Wilman 1351 (McGregor Museum), Vryburg, *leg.* Burtt-Davy 14672 (National Herbarium).

Bechuanaland :—Mochudi, *leg.* Harbor T.M. 14040 (Transvaal Museum).

This species is found in herbaria either under the name of *A. virgatum* Moss ms. or *A. elongatum* Willd. The latter, however, is a Cape species and although I could not decide which species from the Cape really represented the true *A. elongatum* Willd., it was evident that our material did not match any from that area ; the swollen peduncle-apex, rarely absent in our tumble weed and the fairly short stamens so densely, retrorsely, scabrid hairy in the upper half, seem to be typical of our species. *A. elongatum* of the Flora Capensis is either very variable or perhaps a mixture of several species.

The dried inflorescence is remarkable for its lightness. Except for a thin outer layer of sclerenchymatous tissue, the stems consist of pith only in which the thin, vascular strands are situated. At the base of the peduncle, at its junction with the rhizome, probably an absciss layer is formed (in an obconic shape) and it is here that the stalk breaks away.

NOTE BY DR. R. BROOM.

This species of Anthericum that is common in the northern part of the Orange Free State and the southern part of the Transvaal is one of the most highly specialised of the tumble plants. When the inflorescence is in full bloom all the branches are erect. But when the flowers are past and the seeds ripen the lateral branches spread outwards and curve downwards so that the whole inflorescence becomes an irregular ball of twigs. Then the base of the inflorescence separates from the rhizome and the whole ball is rolled over the veld by the wind. In the North-Western districts of the Orange Free State the farm fences catch the rolling balls and in many places these fences are completely lined with Anthericum inflorescences at certain seasons of the year.

A most interesting problem arises in connection with the development of this inflorescence. One can easily understand the advantage it may be to have the inflorescence blown about for miles over the veld, but it is difficult to understand why the ascending branches turn outwards and downwards to make the ball. They act as if controlled by some intelligence which knew that a satisfactory ball would not be made unless the little branches of the inflorescence were bent outwards and downwards. It may be there is some other explanation that can be advanced accounting for the ball formation by purely physical laws, but it certainly looks as if there was intelligence somewhere.

NOTES ON THE SPECIES OF AMARANTHUS IN THE WESTERN CAPE PROVINCE.

By

R. S. Adamson.

While studying the species of *Amaranthus* that occur on the Cape Peninsula in the course of the preparation of a flora of that region, it became apparent that there existed a considerable degree of confusion both in the descriptions and in the nomenclature applied. Material collected and that in herbaria could be arranged into a number of distinct types, but the identification of these brought to light several difficulties. In more than one case quite distinct plants have been grouped together under one name : this is especially the case with what have been termed "*A. Blitum,*" "*A. viridis,*" and "*A. Thunbergii*" by South African botanists. Further, the species which is the commonest in the vicinity of Cape Town did not appear in the floras at all though specimens of the plant can be found under a variety of names in collections.

In the following account the descriptions and identifications have been based in the main on the monograph of the genus by A. Thellung in Ascherson und Graebner Synopsis der mitteleuropäischen Flora V. 1, 1914, 225-356. In this work the species are divided up into a large number of divisions, subspecies, races, varieties, and so forth. These subdivisions have not been taken up here.

Thellung's arrangement is not unfamiliar in South Africa as it was adopted by Burtt-Davy in Manual of the Flowering Plants of the Transvaal I. 1926, 180. The arrangement does necessitate a number of name changes as compared with the account of the genus by Cooke and Wright in Flora Capensis V i. 1910, 408. These changes have been necessitated by the rejection of certain names which have been shown to be based on a mixture of species and the retention of which even in a restricted sense is liable to lead to confusion. *A. Blitum* L., for example, is one of these : this name has been applied by African botanists to what is known as *A. angustifolius,* Lam., but by many European botanists to *A. lividus,* L. *A. viridis* L. is another name rejected by Thellung ; it has been variously applied to *A. lividus* L., *A. gracilis* Desf and broad leaved forms of *A. augustifolius* Lam. The rejection of these names of completely doubtful application as a source of confusion has been supported by other botanists (*e.g.,* Rouy, in Fl. Fr. XII 1910, 22).

Amaranthus L. is a cosmopolitan genus of which several species have become widespread as weeds more especially in the warmer temperate

regions. So much so is this the case that the determination of the real home of some of them is a matter of some difficulty. In South Africa the representatives are partly indigenous and partly introductions from other regions.

Owing to the confusion that has existed in the delimitation of the species, rather full descriptions are given here. The scarcity of records is such that the distribution of the species cannot be given in detail. This is only elaborated for the Cape Peninsula.

The following key covers the species known to occur in the Western Cape Province. Of the nine species enumerated four have been found on the Cape Peninsula.

KEY TO THE SPECIES.

A. Perennial. Stem and leaves hairy. Perianth 2 .. .. 6. *A. deflexus.*
AA. Annual. More or less glabrous. Perianth 3—5.
B. Perianth and stamens 4—5.
C. Perianth 5. Inflorescence a dense terminal spike 1. *A. hybridus.*
CC. Perianth 4—5. Inflorescences short axillary .. 9. *A. Schinzianus.*
BB. Perianth and stamens 3.
C′ Inflorescence terminal, a loose compound spike. Fruit not regularly dehiscent.
D. Fruit much exceeding perianth, smooth .. 7. *A. lividus.*
DD. Fruit shorter than perianth, wrinkled .. 8. *A. gracilis.*
C′C′ Inflorescences axillary shorter than the leaves. Fruit a pyxidium.
D′ Plant tall. Leaves obovate-spathulate. Perianth awn-pointed .. .. 2. *A. Thunbergii.*
D′D′. Shorter. Leaves oval or narrow. Perianth not awn-pointed.
E. Leaves linear-oval. Perianth cuspidate .. .. 5. *A. angustifolius.*
EE. Leaves small rounded at tip more or less orbicular. Perianth short pointed. Plants not over 15 cm. ..
E. Perianth membranous. Fruit wrinkled .. .. 3. *A. Dinteri.*
FF. Perianth green at top. Fruit smooth .. .. 4. *A. capensis.*

1. *A. hybridus* L. (*A. paniculatus* Cooke and Wright Flor. Cap. *et auct. S. Afr.*)

Annual. Erect, 30—40 cm., branches ascending, glabrous. Leaves long petioled (4—6 cm.), obovate, attenuate at base, acute at top, up to 8 × 3·5 cm., dark green with prominent pale nerves below. Inflorescence a dense terminal compound spike, 10 cm. long or more, on main stem and branches. Bracts longer than perianth, awn-pointed. Perianth 5, awn-pointed. Points of bracts and perianth becoming hard in fruit.

Stamens 5. Fruit narrowed above, shorter than perianth, opening by transverse split. Seed black.

Dampish places especially on sand, common in cultivated land. Not native but widely spread. On Cape Peninsula on flats from Rondebosch to Muizenberg, also Hout Bay, etc. Flowers Feb.-Mar. A common weed of warm countries. The South African plants belong to the subspecies *A. hybridus hypochondriacus* Thell. (*A. hypochondriacus* L.) The common form of the plant has the stems and spikes straw coloured sometimes tinged with red.

2. *A. Thunbergii* Moq.

Stem erect, 40—60 cm., sometimes branched, smooth. Leaves spreading, long petioled (1—2 cm.), obovate-spathulate, 1—2 × 1 cm., cuneate at base, blunt at tip, dark green. Inflorescences short, axillary. Bract lanceolate, awn-pointed, shorter than perianth. Perianth 3, awn-pointed, as long as fruit, usually reddish. Points of bracts and perianth not hardening in fruit. Fruit opening by rather irregular transverse split. Seed black.

Sheltered and damp places at low altitudes. Indigenous to S. Africa and rather widely spread. On Cape Peninsula on flats and lowest slopes from Mowbray to Muizenberg. Flowers Feb.-Mar.

3. *A. Dinteri*, Schinz.

Annual, small, 5—12 cm., branched, spreading or ascending. Leaves obovate or suborbicular, petiolate, narrowed below, blade equalling petiole not over 1 × 0·7 cm. Inflorescences short dense axillary. Bract ovate-lanceolate, pointed, membranous with green midrib, shorter than perianth. Perianth 3, unequal, 1 or occasionally 2 in female flowers smaller, membranous, acute, shortly pointed, longer than fruit. Fruit widened above, wrinkled transversely dehiscent. Seed dark brown or black with sharp margin.

Drier regions, generally on disturbed soil, Karroo, Namaqualand, and South-West Africa. Indigenous. Flowers Nov.-Jan.

This species has been confounded with *A. Thunbergii* and with small forms of *A. angustifolius*. The small obovate blunt leaves and short pointed perianth serve to distinguish it.

4. *A. capensis* Thell.

Vey much like *A. Dinteri*, but larger, slightly hairy in the upper parts, leaves abruptly narrowed to petiole, bract equalling the perianth, perianth with very short points and green in upper part, fruit as long as perianth and smooth.

A critical species that needs further study. At present only known from a specimen collected by Ecklon and Zeyher (No. 88) and as a rare

alien in Europe. Thellung in describing the species suggests that it may be a monstrous form of *A. Dinteri*.

5. *A. angustifolius* Lam. (*A. Blitum* Cooke and Wright Flor. Cap.)

Stems 20—30 cm., ascending or prostrate, smooth. Leaves long petioled (1—2 cm.), blades narrow oval, 2—3 × 0·5 cm., entire, slightly undulate at edges, bright green. Inflorescences short, axillary, green. Bracts shorter than perianth, elliptic, pointed. Perianth 3, long pointed, membranous with green midrib, as long as ovate fruit. Fruit splitting transversely, compressed, shortly mucronate. Seed brown.

Drier regions, especially on disturbed soil. Karroo and Namaqualand. Flowers Nov.—Jan. Probably indigenous.

A very variable species of which many varieties have been described ; one of these with rhombic oval leaves, 1—1·5 cm. wide, is var. *sylvester* Thell. (*A. sylvester* Desf.), which occurs locally.

An African species *A. Aschersonianus* Thell., found in central and north Africa, only differs from *A. angustifolius* in having an indehiscent fruit.

A. angustifolius is a native of Africa and probably of southern Europe. It is established in central and northern Europe, in Asia, N. America and Australia.

This is the plant commonly labelled *A. Blitum* in collections.

6. *A. deflexus* L.

Perennial with deep much branched underground parts. Stems up to 50 cm., prostrate, ridged, with rough hairs on the upper parts, becoming glabrous below. Leaves petiolate, rhombic-oval, attenuate at both ends, 1—2·5 × 0·5—1·5 cm., dull green, paler with prominent nerves below, tip rounded or slightly retuse. Inflorescence terminal, leafless, a compound spike, triangular in outline. Bracts ovate, acute, shorter than perianth. Perianth 2, occasionally 3 in male flowers, ovate, acute, half as long as fruit. Fruit brownish or red, compressed, ovate, distinctly narrowed above, with 5 green nerves, slightly emarginate at top, not regularly dehiscent. Seed brown.

Established on disturbed ground and roadsides near towns, especially on the coast belt, but also inland. It occurs as far north as Livingstone. Very common near Cape Town. Flowers July-Oct.

A native of South America : naturalised in southern Europe and elsewhere.

7. *A. lividus* L. (*A. Blitum auct. plur. non Flor. Cap.*)

Annual. Stem 15—20 cm., erect or ascending, soft, glabrous, shining, usually red. Leaves long petioled, 2—2·5 cm., rhombic, cuneate at base, distinctly retuse or emarginate at tip, with a small mucronate point

in the sinus, dark green, slightly paler below with pale nerves. Blades 2—3 × 1—1 ·5 cm. Inflorescences terminal on main shoot and branches, rather short (1—2 cm.), loose, spicate, leafy below, not exceeding leaves. Bracts oval, acute, much shorter than perianth. Perianth 3, equal and boat shaped in male flowers, in female 1 segment much smaller. Fruit exceeding perianth, soft, red, slightly compressed, without nerves, emarginate at top, not regularly dehiscent. Seed large, dark brown with blunt margin.

A weed of cultivated land. On Cape Peninsula occurs at Rondebosch and Claremont. Flowers April—May. A native of south and middle Europe. The S. African plants belong to the race or variety *ascendens* Thell. (*A. ascendens* Lois.)

This is the plant commonly referred to as *A. Blitum* in European floras.

8. *A. gracilis* Desf. (*A. viridis* Cooke and Wright, Flor. Cap.)

Closely allied to *A. lividus*. Distinguished by short hairs on upper parts ; ridged stem ; leaves slightly emarginate at tip, whitish below ; inflorescence elongated, green ; perianth longer than fruit ; fruit rounded, wrinkled.

Recorded from E. Province but widely spread as a casual. Occurs in Central Africa, Australia, Pacific Is., S. America, and southern Europe.

This is the plant referred to *A. viridis* L. in African floras, but specimens of *A. lividus* and *A. deflexus* are included under that name.

9. *A. Schinzianus* Thell.

Annual, 15—20 cm., Stem pale. Leaves oblong-lanceolate, 1—1 ·5 cm. including petiole, obtuse, cuneate at base, pale below. Inflorescence short axillary ; bract shorter than perianth, membranous, obtuse. Perianth 4—5, oblong not pointed. Stamens 3—4. Fruit slightly shorter than perianth, wrinkled, opening by irregular transverse split. Seed black.

Indigenous. Dry regions : Karroo near Laingsburg ; and South-West Africa in Great Namaland.

Externally this species resembles *A. Dinteri* or small forms of *A. angustifolius*, but is distinguished from all others by the 4—5 partite perianth with the short axillary inflorescence.

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REVIEWS AND ABSTRACTS.